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W. A. HARDENBERGH and A. PRESCOTT FOLWELL
Editors

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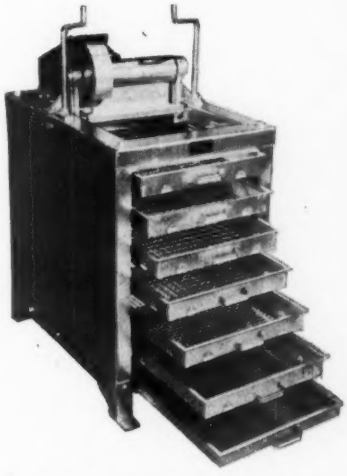

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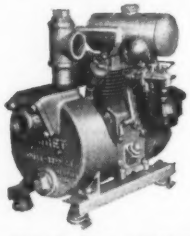

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The Editor's Page

The Future Need for Engineers, and the Supply

Right now there is a shortage of engineers. This is due, in part, at least, to the fact that practically no engineers were graduated during the four or five years after 1941 or 1942. Also, right now our engineering colleges seem full of students. What will happen within the next few years? Will there be too many engineers, or not enough? In a recent report of the Engineers Council for Professional Development, the statement is made that industrial employment of engineers has increased 56% since 1938, that employment of engineers in research has been much greater than in industry; and that government also has increased its usage of engineers. Of particular interest is the estimate that by 1950, 46% of all engineers will have entered the profession within the 10-year period of 1940-1950; and more than half of these in the 1946-1950 period. This indicates that the great bulk of the engineers in the coming few years will be young men; it also points out the need for guidance for these younger men. There is some indication that the accumulated need for engineers will have been met by 1952, though this does not take into account expansion and development that may reasonably be expected to occur, overseas opportunities, and similar openings for engineers.

Summing it up, it seems to us that there will be lots of opportunity for another five years for everyone. After that, it may take a little more stuff to get ahead because the competition will be harder. No engineer should neglect an opportunity to broaden his viewpoint, learn administrative and management procedures, and develop initiative and imagination.

Construction Price Trends and Factors Influencing Them

Highway projects utilizing Federal Aid form an excellent yardstick for measuring construction costs. In the second quarter of this year, common excavation was 35¢ a yard, up 2¢ from the average of the preceding four quarters. Unclassified excavation was also up 2¢, to 46¢ a yard. Rock excavation was down 2¢ to $1.25. Structural and reinforcing steel was up. Concrete for superstructures was up to $47.21 per yd., from $44.15; for substructures, up to $43.99 from $40.38; and for foundations and footings down to $32.56 from $35.25. Most highway surfaces were up slightly.

No one knows what costs are going to be in the future. The scarcity of certain materials, delaying work and creating uncertainty for contractors, is one factor tending toward higher prices. A free flow and ample supply of materials and equipment will help to remedy this. Another factor is the tremendous shipments overseas for relief and rehabilitation. So long as these must continue, creating additional scarcities and increasing prices for food and other necessities, our construction costs will continue to rise. It may well be that the billions we spend for overseas relief, largely for our former enemies, may be a minor part of the eventual costs to us. The remainder will be the hidden costs of higher prices that will enter into everything we do, and into our structures, and will be a burden to us from here on. It costs money to win a war, and more to pick up the pieces after we have won.

Solids Disposal at the Sewage Plant

The past few years have taught us much in sewage treatment, in part at least because replacements and enlargements normally made to meet increased loads had to be deferred. Among the lessons seems to be a strong indication that we have been designing many of our sludge digestion units with a too small margin of safety. Sludge treatment and disposal is one of the most difficult problems in sewage treatment, and is generally the one that first shows signs of trouble. Overloaded digesters contribute to poor operation of other plant units. Strong supernatants put a heavy load on secondary treatment devices. The best answer seems to be a more generous design basis for sludge digestion. It costs very little more to provide extra capacity in the first place, and it is mighty good insurance to do so.

Military Engineering in the Defense Setup

A very large number of engineers served in the military forces during our recent wars, and they should be interested in sound utilization of engineers in the new National Military Establishment which is headed by the Secretary of Defense. There are ominous factors in present trends. One of them is the proposal to eliminate branches, and commission all officers in the Army, for instance, as a whole; this means that there will be no Corps of Engineers; any officer may be assigned to duty of an engineering nature, regardless of his qualifications, if his commander so wishes. Another is the probability that in the Department of the Air Force, engineers will be in the same category as other ground personnel, and largely interchangeable with them. A third is the trend toward earlier retirement for age, whereby the training and experience of the older engineers will largely be lost. And still another is lack of any provision for an overall engineering organization to serve the entire military establishment, fixing uniform standards and policies, and coordinating equipment, training and procedures. It goes without saying that these faults must be combatted if this nation is to utilize advantageously its engineering skills and techniques in its military establishment.

Jet Planes and Airport Runways

There are some indications that the wider use of jet-powered airplanes will provide another and very serious problem in the design of airport runways. Usual types of surfacings are subject to deterioration from the hot blast discharged from the engine. It is reported that consideration is being given to a firebrick surfacing for some of the runways where these planes are being used. Here is another case where new developments are creating new needs and challenging the skills and ingenuities of engineers.

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Dewatering and drying equipment in Sewage Disposal Plants has for the past few years operated under difficult and trying conditions. Operating records covering these years are an excellent recommendation as a guide to performance in the future.

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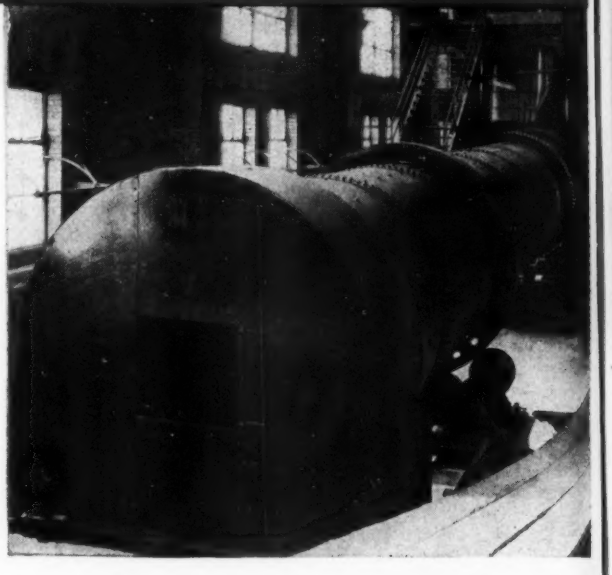

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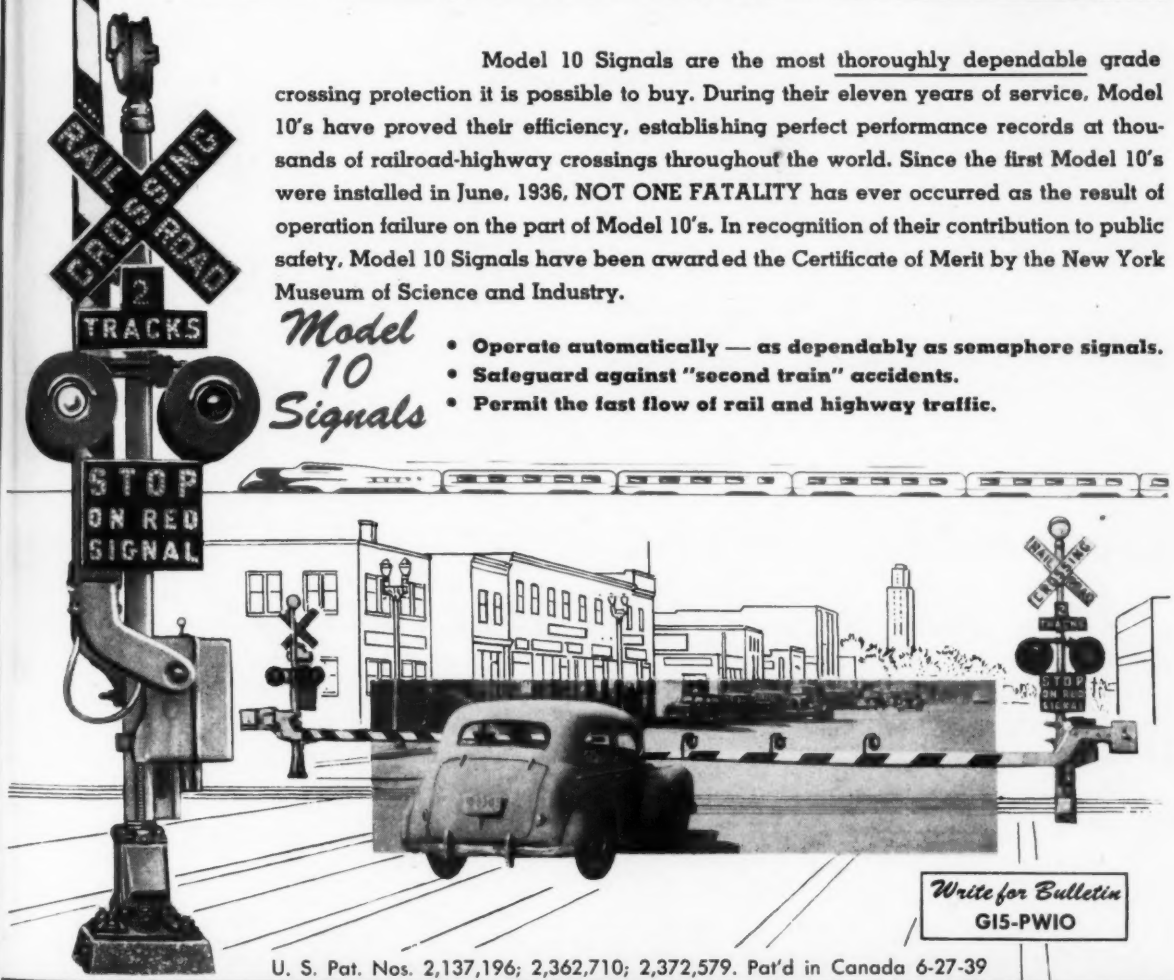

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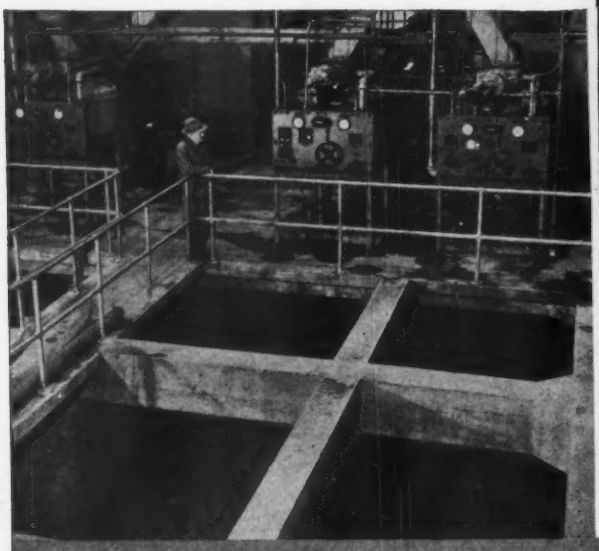

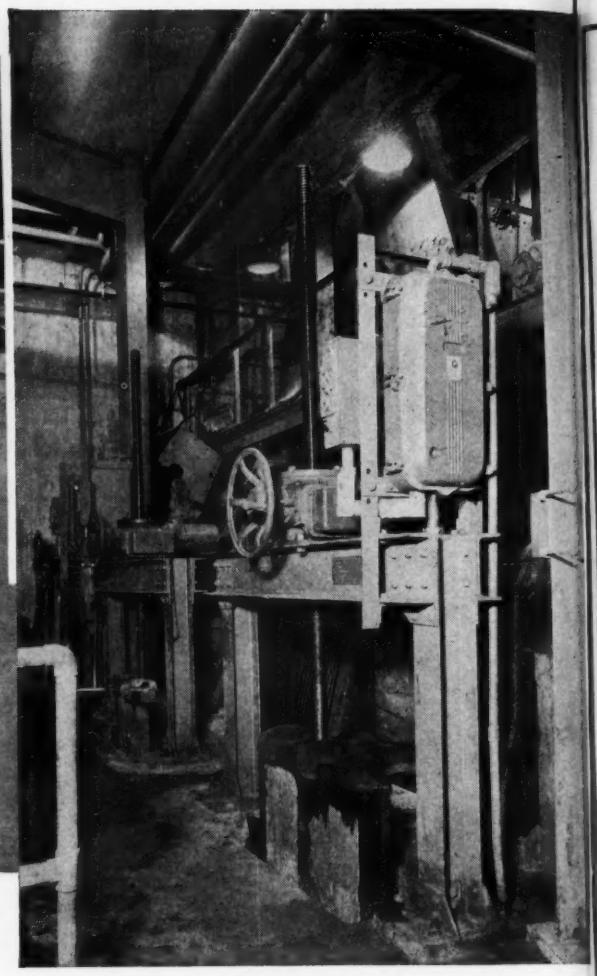

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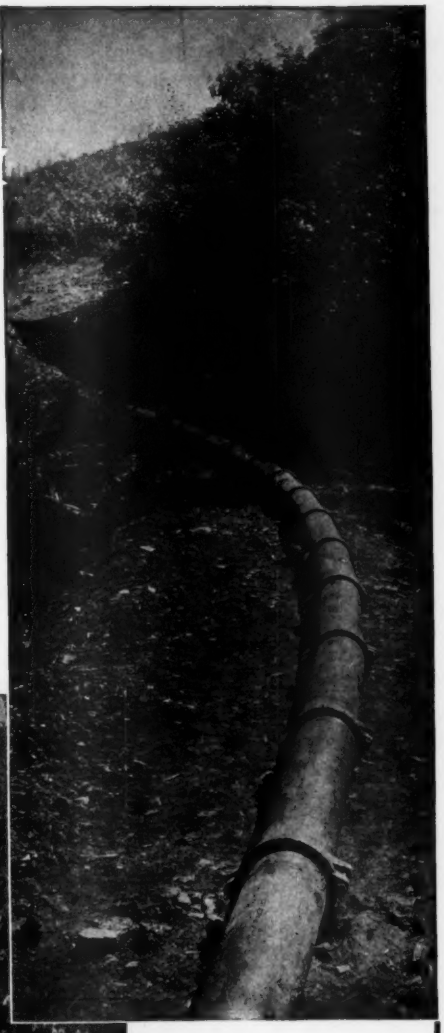

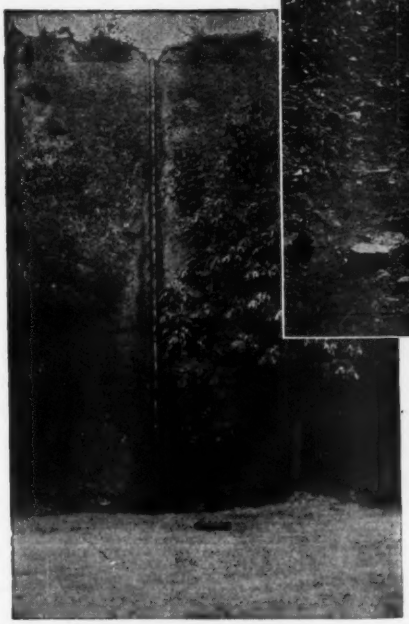

Above *All straight lengths of Universal pipe in this curve.*

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A combined tabulation of the 25 tables reveals a remarkable experience with cast iron distribution mains. In these 25 cities, more than 96 per cent of all cast iron mains in sizes 6 inch and over, that have ever been laid are still in service.

With the permission of the A.W.W.A. we have reprinted the facts as they apply to cast iron pipe in a brochure "Survival and Retirement Experience With Cast Iron Water Mains." If you have not received a copy, write us. Cast Iron Pipe Research Association, Thos. F. Wolfe, Engineer, Peoples Gas Bldg., Chicago 3, Illinois.

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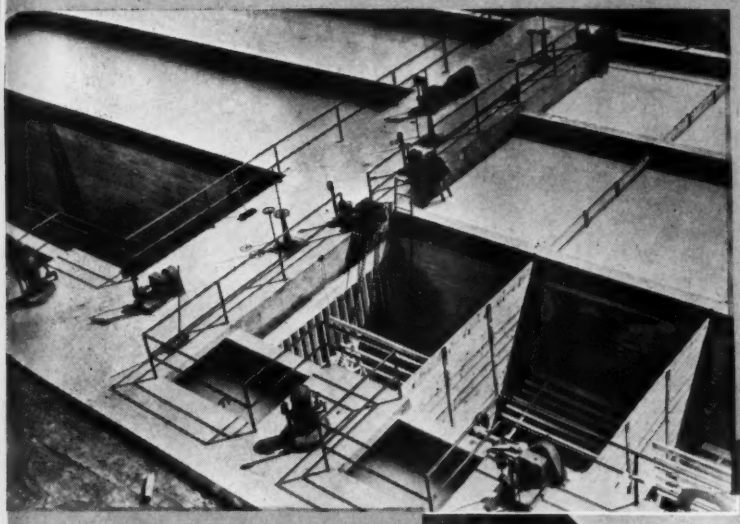

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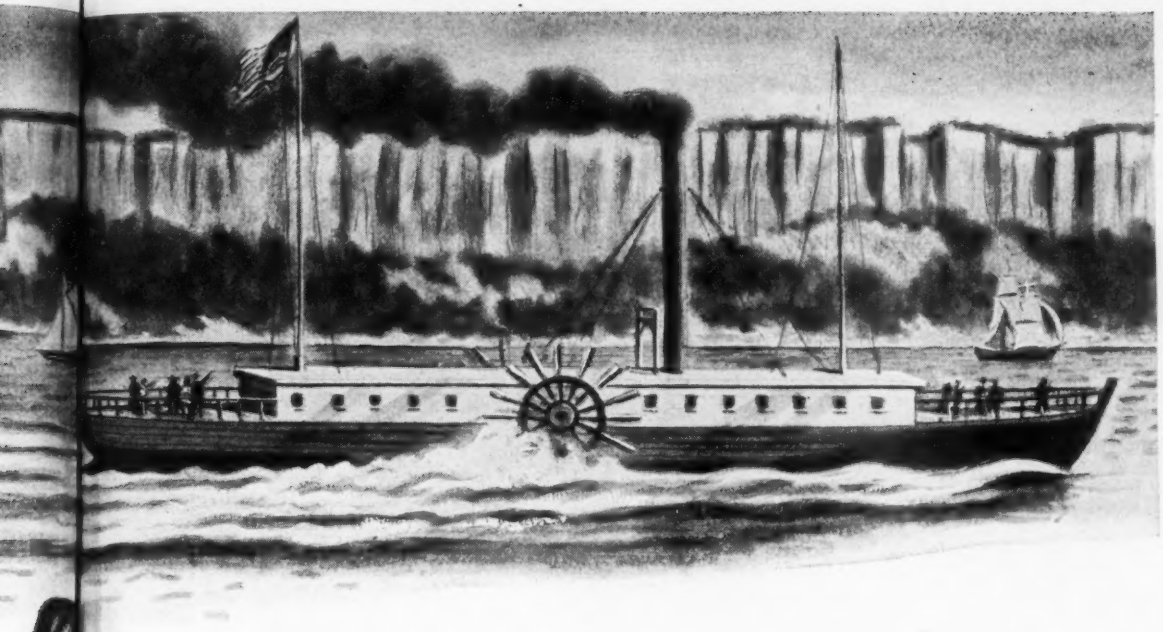

.. and they said, She'll never turn a wheel"

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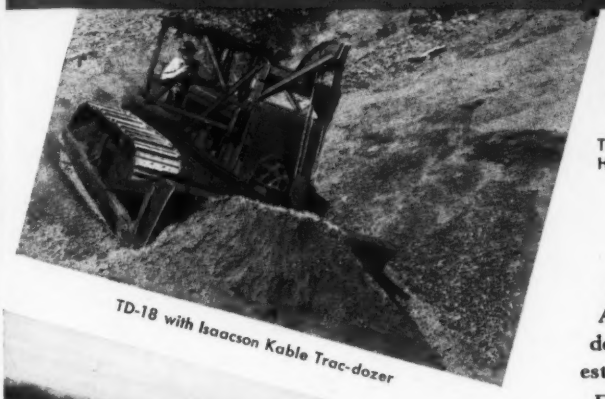

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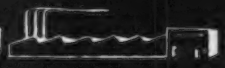
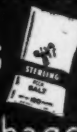
Icy pavements and snow-filled streets hamper business, cause accidents to pedestrians and vehicles, endanger lives of school children. Continuous storms create fuel shortages, cut vital public services. Yet many cities now enjoy snow-and ice-free streets thanks to STERLING *"Auger-Action"* Rock Salt. It removes snow and ice, saves lives and property... keeps business and industry humming  and time, labor and money are saved with clean quick-acting STERLING  Rock Salt. *ORDER NOW!* In carloads - bulk or 100 lb. bags. A trained representative will gladly call. *Write Today!*

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Grading and Ditching 85 Miles of Roads Using Modern Equipment

A new force feed loader more than doubles the rate of work. A rolling filling station and good organization help toward faster progress and lower costs.

By JOHN W. DOWLER
County Engineer and Surveyor

ONE of the biggest problems a County Engineer has to face in hill country is the drainage of the roads under his jurisdiction. Athens County, Ohio, is located in the southeast corner of the State in very hilly terrain. There are 350 miles of County Highway, all with traffic-bound surfaces except for 25 miles of black top. The 600 miles of township roads are surfaced with gravel, "Red Dog" cinders, boiler cinders or, as in many cases, are not surfaced at all.

Ditching Is a Vital Need

From an inspection of our 350-mile County Highway system it was determined that ditching was the vital need of our roads. Mile after mile had no ditches at all: even worse, the berms were from 4 to 6 inches higher than the pavement, and if there was a ditch it was separated from the edge of the road by the high berm. Years of war-time neglect and surface maintenance with power graders had built up a false ditch at the edge of the pavement causing all surface water to run along the edge of the pavement. This led to many other maintenance problems and caused rutting, breaking up of the pavement where water could not get away, and kindred troubles.

In 1945 with a serious equipment shortage and deterioration, we fortunately secured a front-end loader, with which we started ditching operations. By using most of our equipment and manpower on this ditching operation we completed ditching forty miles of road that year. When bad weather arrived and we added up the season's work, simple arithmetic proved that it would take eight years to do the job and then the ditches would be as bad as when we had started. Experience has shown us that our road ditches stay fairly serviceable for about three years. therefore our ditching crew must get over one hundred miles of road each year on our county system and ditch several miles of township roads at the same time. Average weather conditions allow us 150 ditching days per year or from the middle of May until the middle of November.

The Athey loader picking up a windrow.

In May, 1946, the County purchased an "Athey" force feed loader, a machine designed to pick up material from a windrow at the rate of five cubic yards per minute. With this new machine, a few old small trucks and a hydraulic pull grader we set out to get that hundred miles of road ditches.

After the graders have passed.

Modern Equipment to the Rescue

At the time this loader was delivered we were ditching, using our front-end loader for earth removal. The machine was delivered one evening. When I went on the job the next morning it was in a nearby field and the boys were using the front-end loader. Most of our truck drivers were skeptical of the machine and some kidded about its ability. We placed the machine in operation and soon had all four trucks loading from it. That was the end of trucks waiting in line to be loaded and four truck drivers found themselves with an endless job trying to take away the stream of earth that came up that belt at them.

After some experimentation we finally provided the following equipment for our ditching crew: a power mower; an Allis-Chalmers SO tractor pulling a 12-ft. blade hydraulic pull grader· four small trucks; the

The completed road.

Athey Loader; and a power grader. Personnel consisted of a foreman and six laborers together with the operators of the equipment. That made a force of 15 men and $30,000 worth of equipment. Our overall cost of maintaining this crew was near $175 per day and our average mileage was 0.6 mile completed per day. Earth excavated from the ditches and hauled away approximated 900 cu. yds. per mile, with little variation either way. A total of 3200 lin. ft. of new corrugated iron culvert pipe was used during the summer for renewal, widening and in some cases new locations.

Organization of the Work

Operations were necessarily dependent on each other. The grass and weeds were cut ahead. The next operation, and one that saved a large tonnage of stone, was the windrowing of all loose surface material on the opposite side from the side being ditched. This was done by the power grader. Then the pull grader cut the berm and false ditch away to an inch-to-the-foot slope, windrowing the material. The Athey loader picked up this windrow and placed it in the trucks. The foreman was always out ahead arranging with farmers for places to dump the dirt. This was an important item because the length of the haul determined the output. When things were clicking, a truck was being loaded with dirt every three minutes. After the berm material windrow was removed the pull grader excavated the ditch and the power grader pushed the windrow over to where the Athey could pick it up, which, on our 24-ft. roadways, was at about the quarter point. After the completion of this operation the surface material was moved to the other side and both operations repeated on that side of the road. Each mile of road with ditches on both sides had four miles of windrowed earth to be removed. After completing the earth removal, the power grader polished up the grade and the laborers opened up culvert ends, completed culvert replacements, and did the hand ditching necessary around bridges and culvert headwalls.

The completed road had all of the original stone surface, and a surprisingly small amount of earth was left on the surface. When possible and where needed a light coat of stone was placed on the completed roadway. After completion we knew that here was another stretch of road that would not need heavy application of stone in the fall and winter to keep it passable.

Going After 100 Miles Per Year

To load a truck with the Athey loader, the truck must back up as the loader goes down the road, and a two speed axle is fine as the low gear ratio is the same as the speed of the loader. We feel that the machine would serve better if it had a side loading device, enabling the truck to go ahead while filling instead of backing. However it is surprising how expert the truck drivers become in staying with the loader after a few days of experience.

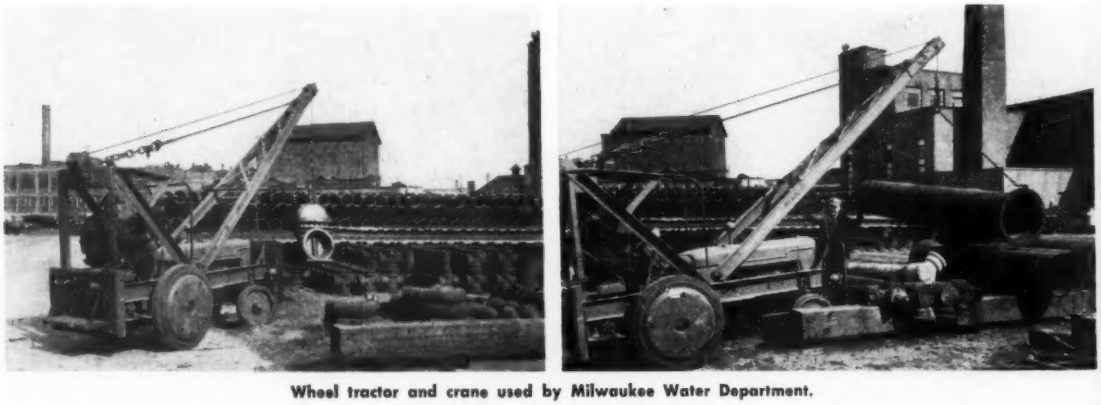
This year we have had five trucks hauling, three of them new, of 7-cu. yd. capacity and with two-speed axles. We are also providing a rolling filling station, with gasoline, fuel oil, grease, etc., and expect to leave all equipment on the job and haul the crew to and from the job. With the customary portal-to-portal pay, we expect to get three-fourths of an hour more work completed in an eight-hour day.

When the rains stopped operations in late November last fall we had completed eighty-five miles of roads at a cost of about $300 per mile and had created a big demand from residents along the other roads to have their roads ditched as soon as possible.

We think we are going to get that 100 miles for sure this year.

Crane Equipped Tractor Handles Valves and Pipe

The City of Milwaukee uses an International I-4 wheel tractor equipped with a Mercer crane for handling and unloading big pipe and valves. The illustration at the left shows this unit handling a large valve in the Water Department yards. At the right, the same unit is stacking large cast iron pipe.



Wheel tractor and crane used by Milwaukee Water Department.

Pre-heated Air in Refuse Incinerator Practice

The values of pre-heating air for incinerators; the savings accomplished; three types of pre-heating devices; and factors in their use.

By **HENRY W. TAYLOR**
Consulting Engineer

AS OFTEN happens, the doctors—of incineration—disagree. Some say that refuse is becoming dryer, the need for pre-heat is less, it's seldom used and why bother about it. Some say that no incinerator should be installed without a pre-heater. And others insist that not only pre-heat is necessary but also a quickly available auxiliary fuel which can be turned on and off with speed and judgment.

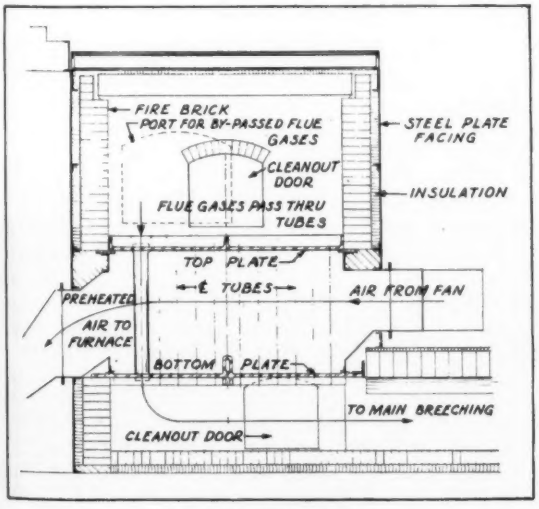
No doubt refuse is dryer and cleaner than it used to be. Garbage is better drained and refuse contains less miscellaneous non-combustibles. But we still have a season when fresh fruits and vegetables increase the normal moisture; and when rinds, husks and peelings augment the resistance to burning. And we still have rain that finds its way into household refuse containers and collection trucks.

Pre-Heated Air Adds Heat as Well as Oxygen

It may be worth while to consider pre-heated air for a few minutes in its simplest phases, free from the sales talk of those for or against. In the first place, pre-heating the air delivered to an incinerator adds heat as well as oxygen to aid in combustion. To use figures which are approximate but easily remembered, assume the following:

Incinerator capacity, 100 tons a day; atmospheric air, 70° F.; air supply per lb. of refuse, 4 lbs.; pre-heated air delivered at 400° F.; Btu in coal about 11,000 per lb.

Arithmetic shows that this pre-heat is equal to one ton of coal for each eight-hour shift. Thus, 100 tons x 2000 lbs. per ton x 4 lbs. of air x 330° F. added x 0.25 specific heat of air, divided by 11,000 Btu = 6000 lbs. of coal per 24 hours or 1 ton per 8 hrs.



Tube pre-heater installation.

If the outside air is 0° F., the preheat equals 1.2 tons of coal per 8 hrs.

In other words, if the stoker of the furnace supplies his fire with the above pre-heated air, it will contribute the same amount of heat as one ton of coal during an eight-hour period and produce no additional ash. Looking at it another way, 22 million Btu will theoretically be added in eight hours, or sufficient heat to evaporate about 20,000 lbs. of water. This would dispose of the moisture in 20 tons of refuse with 50% moisture.

But there is another factor in the situation; this heat added to the air supply increases its volume. Preheated air delivered at 600° F. would double the volume of air supplied at 70° F. For intermediate values, a simple rule gives approximate results: From the temperature of the pre-heated air, subtract 70° F.; for each step of 50° F. in this remainder, the volume is increased about 10%. A pre-heat temperature of 220° will include three 50 units and increase volume by 30%. The exact figure is:—

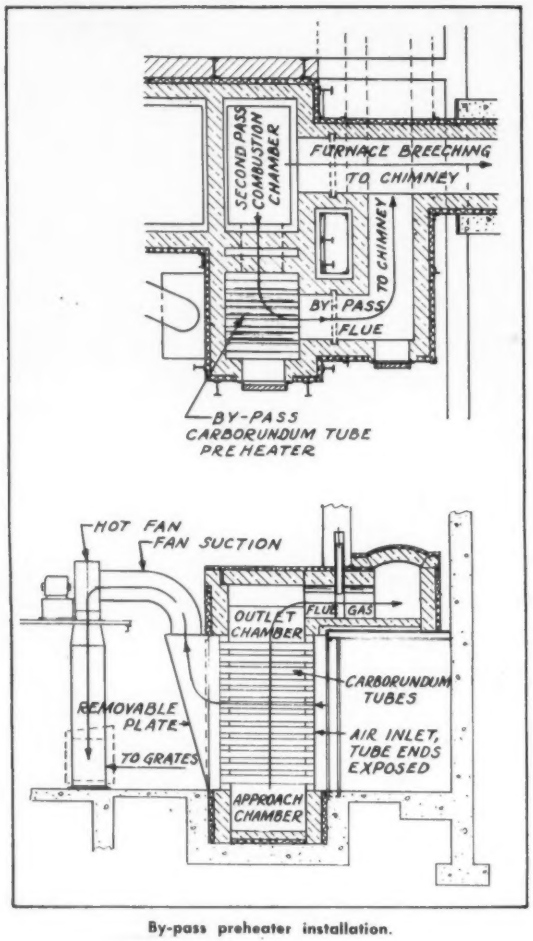
$$\frac{460 + 220}{460 + 70} = \frac{680}{530} = 1.28, \text{ or } 28\% \text{ increase;}$$

and for 400; the increase is $\frac{460 + 400}{530} = 1.62$, or 62% increase.

This increase in volume may or may not be an asset depending on the furnace design. If the grate area is ample and the grates well stoked for coverage, the increased volume very probably distributes the air more completely through the area of fuel bed. However, if the burning rate is high and the grate area is small, this increase in volume will definitely disturb a refuse fuel bed, produce fly ash, force blow holes and be a detriment in operation. Therefore, the design of the grate area must take into account this increased volume of air and make allowance for it. This allowance does not seriously affect a design with normal grate areas, but does affect the high, over-sanguine rates which may succeed with dry refuse of picked characteristics. If 1 sq. ft. per ton per day of burning grate is allowed in the design, the velocity of 70° air through the grates is probably less than 4 feet per second. With pre-heated air this velocity will approach 6 feet per second. In the fuel bed further expansion increases this velocity. A considerably reduced grate area per ton per day will considerably increase these velocities and a point will be reached where, considering velocities alone, grate area reductions with pre-heated air (or without it), will seriously impair satisfactory operation.

Types of Pre-Heaters

In present incinerator practice, there are three main types of pre-heaters, the metal tube, through which



By-pass preheater installation.

the hot gases flow; the carborundum tube, through which the air flows; and the air-gas mixture type where flue gases are directly mixed with the air in a proportion to produce the desired pre-heat temperatures. The metal tube type is generally constructed as a by-pass heater, installed at the side of the main gas flow and 50% of the flue gas is diverted through the metal tubes when the pre-heat is being used. The usual surface allowance for the tubes is 7.5 sq. ft. per ton per day. In actual operation, this unit of surface is subject to serious question if a pre-heat temperature of 400 degrees is to be attained.

The second type of heater is generally installed in the path of the total volume of flue gas. Experience with tube breakage is pointing toward a by-pass location also for this heater for pre-heats of 350° F. A by-pass location saves these tubes from major thermal shocks, permits gradual warming up, avoids better than 60% of the fly ash to which they are otherwise exposed and provides an opportunity for the development of an ample entrance chamber for catchment of fly ash and an upward flow of flue gas. It furthermore permits inspection and repair while the furnaces, themselves, are in operation. In the practice of this office, this by-pass arrangement is being used in designs for this type of heater, the inlet end of the tubes being open to the air and a "hot" fan used as a blower. The design is based on one tube per ton per day, a pre-heat of 350° F., with about 60% diversion of flue gas and the estimate that the life of the tubes will be increased from 200% to 300%. An ample fly ash catchment chamber is provided beneath the tubes and flue gases are tapped off from the end pass of the combustion chamber at a low level so that an upward flow can obtain in the heater and the cooled gases returned to the breaching header by a lateral flue.

The third type of pre-heater is of recent origin. The principle is that of mixing two bodies of gas of different temperature to obtain a desired intermediate temperature. It must also be remembered that, in one case, the gas contains oxygen, while in the other case we may assume that it doesn't. If we make the following assumption, it is possible to illustrate what happens: Atmospheric air, 70° F.; flue gases, 1600° F.; desired pre-heat, 400°F.

To raise one pound of air from 70° to 400° will require 82.5 Btu. To absorb 82.5 Btu., above 400°, from the flue gases will require, where P is the required admixture of hot gas

P x 1200° x 0.25 = 82.5 Btu, whence P = 82.5 ÷ 300 = .275.

Consequently we have our original pound of air and its oxygen loaded up with 27½% additional weight. The resulting added volume does not affect the chimney but does influence the design of grates and the furnace chamber, combustion chambers, etc. As related to 70° air, we have done two things: increased the volume of the air by over 60% by expansion; added to the original weight of the air by admixture of 28% of its original weight, this increment having already been expanded to 162%. If one pound of air @ 70° is taken as one volume, we have: 1.28 x 1.62 = 2.06 volumes; or, by this method of pre-heating to 400° F., the volume of the mixture is twice as great as the unpreheated air at 70°, or 40% greater than that produced by the other types of pre-heaters.

In applying this type of pre-heat, consideration must be given to increasing the volume of gases through grates and chambers. Practice, as well as the theoretical back-ground, has confirmed this necessity. Its feasibility will depend upon the case in question and the balance of costs of construction and costs of maintenance after considering the adaptations required by its use.

The writer includes himself in that group which provides for incinerator projects a method of pre-heating adapted to the case, and a quickly available auxiliary fuel for occasional use during critical periods of refuse moisture. It is also considered that pre-heat is a factor which cannot be arbitrarily superimposed on a design and that its characteristics must be recognized and incorporated in the design of the furnaces, chambers, flues and ports.

Standardizing on Survey Stakes Saves Money

Economizing in the purchase of survey stakes may seem like picayune business, but California's Division of Highways is saving $15,000 a year by purchasing them under a yearly contract rather than locally, as needed. The Highway Division uses about 1,350,000 stakes a year, and formerly these were purchased in 23 different sizes by the 11 highway districts, at a total cost of $40,000. By standardization on 6 different sizes, and buying a year's supply at a time, the required number of stakes were purchased for distribution to the various districts for a total cost of $25,000, a net saving annually of $15,000.

The two concrete standpipes. The one on the left has been repaired.

Waterproofing a Concrete Standpipe

Details of repairing a 36-year old structure which was spalled and leaking. Information on methods of original construction.

By HAROLD S. CROCKER
City Engineer, Brockton, Mass.

TWO reinforced concrete standpipes were designed and constructed, in 1911, by Charles R. Felton, then City Engineer, for the City of Brockton, Mass. Each one has a capacity of 4,000,000 gallons, a diameter of 160 feet, and the walls are 26½ feet in height. To quote Mr. Felton, "the concrete is of very rich mixture, to render it impermeable." The lower courses, to a height of 10 ft., were mixed one part cement, one part sand, and two parts stone. Above this elevation, the mixture was 1:1½:3. Hydrated lime, in the proportion of 5% of the cement by weight, was added to both the mixtures.

The floor consists of two courses of concrete, each 6 ins. thick. The lower course was 1:2:4 and the upper one, reinforced, 1:1½:3, with half-inch round rods spaced 12 ins. both ways.

The maximum tensile stress on the reinforcing rods was calculated at 13,000 pounds with the standpipes overflowing. At the proposed high water mark, 18 ins. below the top, the stress is 12,000 pounds.

Method of Original Construction

The standpipes were constructed by day labor employed by Horace Kingman, then Water Works Superintendent, under the direction of Mr. Felton and assistants. We quote Mr. Felton again, "The greatest care was taken to make the concrete impermeable, an entire course being run when once started. These courses were 30 ins. in height, except the bottom one, which was 36 ins. and contained about 110 cubic yards. No departure from this plan was found necessary, the concrete being placed continuously in courses 6 ins. thick, from 3½ to 6 hours being consumed on a 30-inch course. After the concrete had partially set, usually in about 7 hours, it was thoroughly scraped with wire brushes and kept wet until the next course was ready, usually covered with wet bagging and carefully swept just before placing. A steel dam, 4 ins. by ⅜ inch, was embedded 2 ins. deep in the top of each course, and about one foot from the inside. In addition to the dam a triangular groove about 1.5 ins. deep was placed in the top of each course. Before beginning a new course the joint was washed with neat cement grout. No waterproofing or brushing of the surface was required or allowed, and less than a quart of cement was required to remedy any defects of appearance."

The total cost of the work, exclusive of engineering, was almost exactly $80,000 or about one cent per gallon.

When the structures were put into use, there were a few small leaks at bolt holes but absolutely none through the concrete or at the joints. As a test of the amount of leakage, the largest leak which could be found was piped and carefully measured. At the beginning, the rate was about three pints per day, which gradually decreased to less than one tenth of a pint in twenty-four hours. The work was finished in October and the tanks filled and put into use immediately. The next spring, there were a few wet spots here and there but no leak large enough for water to reach the ground.

For a period of several years, there was no indication of any leakage whatever. In time, however, regardless of all precautions taken during construction, small leaks appeared causing disintegration and spalling of the concrete on the outside of the walls. Some of the reinforcing rods were exposed to the weather. The inside was apparently in as good condition as when completed. The safety of the structures demanded that repairs should be made. It was, therefore, primarily necessary that the inside face of the wall be waterproofed to prevent the damage that was taking place on the outside. Money was appropriated late in 1945 to repair one of the two structures.

Where the wall joined the floor of the standpipe, concrete had been poured to form a concaved coping whose radius was twelve inches. A groove 9 ins. wide was cut through this coping and down into the floor 1½ ins.

The entire surface of the inside of the wall, together with the above mentioned groove, was thoroughly cleaned with wire brushes and water. The specifications called for loose or scaling concrete to be removed but none was encountered. After the surface was thoroughly dried, a heavy primer coat of waterproofing asphalt, to fill all cracks, was applied at the proper melting point. This course, as well as all later ones, formed an unbroken shield. While the primer coat was still hot, one thickness of 15-pound asphalt-saturated waterproofing felt, laid in horizontal strips, was embedded into it.

This process was continued three more times with heavy moppings of asphalt and the application of the felt. Then followed another mopping of hot asphalt to which was applied an outside layer of 10-ounce asphalt saturated woven cotton fabric and, finally, one more coat of hot asphalt. Thus was formed a five-ply membrane waterproofing with six coats of waterproofing asphalt, all thoroughly saturated, cemented, and bonded together and also bonded to the concrete, groove, wall, and capstone of the tank. At each mopping, one gallon of asphalt averaged covering 22½ sq. ft. of surface.

Because of ice formation during the winter months, it was necessary to protect this waterproofing membrane so that it could not be punctured. Accordingly, a brick lining was laid up over the waterproofing. In the groove already described, a base was laid 8 ins. wide and two courses high. On top of this, a 4-in. lining of hard burned brick was constructed to the full height of the standpipe. Extreme care was maintained during the laying of the brick to preserve a ½" mortar course between the brick and the fabric. The groove was then filled with hot asphalt to form a shoulder at the joint between the brick work and the concrete floor.

As there was a possibility that rain water might enter between the old wall and brickwork, a capstone was made to fit over the top of the new work and the original cap. This capstone was pre-cast reinforced concrete, each section 5 ft. long, with overhangs at each end extending 4 ins. below the top of the original wall. They were laid with mortar joints to within an inch of the top and then poured with asphalt to make a flush joint.

The ground level at the standpipes is 56 ins. above the floor level and the latter is also the elevation of the footer outside the wall. Excavation had determined that there was no disintegration of concrete below the ground level nor was there any spalling for a distance of 9 ft. below the top of the wall. All damage on the outside of the walls was confined to the belt in between, which measured 12 ft. 10 ins.

Outside Repairs

It was decided that the repair work there should be made and covered with a cinder block wall. The footer of the tank made an excellent footer for this new protecting wall. Excavation was, therefore, carried out to that depth. Two sets of holes, one 12 ins. above the footer and the other 12 ins. below the ground, were drilled into the wall of the standpipe, each 6 ins. deep, at 30° with the horizontal. They were spaced 4 ft. apart and staggered. Dowels were inserted into these holes and a 6 in. concrete wall was poured to the ground level.

The outside of the standpipe wall was cleared and prepared in the same manner as the inside work was done. The exposed reinforcing rods were also thoroughly cleaned to remove all rust and other foreign matter. Holes 4 ins. deep were drilled into the concrete 4 ft. apart horizontally and 2½ ft. vertically; ¼ in. galvanized anchors were inserted into these holes long enough to extend an inch beyond the shell of the cinder blocks. They were bent to hold the blocks in place after erection.

The 4-in. cinder block wall was laid on the concrete foundation to an elevation of 12 ft. 10 ins. above the ground, using 4"x8"x16" blocks. At the top of the blocks, a 3-in. slot, 1 in. deep, was cut into the wall of the tank and a concrete cap was poured to shed rain.

The construction method specified was as follows: After the wall had been thoroughly cleaned, one coat of clear Anti-Hydro was brushed on. Then a "slapdash" coat as a binder was applied, consisting of one part Portland cement and two parts sand, together with one quart of Anti-Hydro per bag of cement. The cinder blocks were laid up in mortar and the space between the new and old wall was filled with 1:2:4 concrete. The stone was not over ½ in. in its largest dimension. The brush coat, "slapdash" coat, and the blocks, followed by the concrete, was a continuous operation.

Excellent work was done by the local contractor, H. F. Johnson & Sons, the low bidder, at a cost of $26,354.88. There is no indication of any leak and it is the hope of the Superintendent of the Brockton Water Department, Daniel M. Ryan, that sufficient money may be appropriated this year so that the other standpipe may be repaired by the same construction methods.

DDT for Controlling Filter Flies

A summary of available data on the control of trickling filter flies by means of a DDT emulsion has been prepared by Proportioneers, Inc., of Providence, R. I. The report, which is available on request, states that an amount of DDT equivalent to 1 ppm. of the total daily flow of sewage is apparently 100% effective in controlling the flies in the dosed area. Elimination of flies outside the dosed areas can be handled by tank or power spraying of 5% DDT emulsion on the dry rock, filter walls and small areas of grass.

The DDT can be applied while the filters are in operation without any serious decrease in plant efficiency. The frequency of application required for control will depend on larval development and varies with the season and the temperature Under the most adverse conditions, applications may have to be made weekly.

Dosing the sewage with DDT does not destroy the growths on the filter rock, or cause them to unload or slough off. The proportioning equipment is simple and inexpensive and can be arranged to maintain automatically the minimum effective dosages of the chemical.

Charges for Water Main Extensions in New Bedford

The Water Board of New Bedford, Mass., has adopted a policy of extending without charge 50 feet of main pipe for each new water user, and charging an annual assessment of 20 cents a foot for a period of 15 years for mains in excess of 50 feet per user, except where annual water bills exceed this assessment. During 1946, 3,867 ft. of main extensions were made to serve 23 new water users.

Bids, Contracts and Bonds for Highway Construction and Maintenance

Advertising; examining plans and specifications; ambiguous contracts; bonds.

By JOHN SIMPSON

"Repair Work."—The Iowa Supreme Court holds [Baldozier v. Mayberry, 285 N. W. 140], that work done on a drainage ditch to prevent the erosion of the banks of the ditch was "repair" work within a state statute authorizing an assessment to defray the cost of repair work without notice of the assessment, even though the work also benefited a road at the side of the ditch and two bridges across the ditch. Although without the piling it would eventually have been necessary to relocate the road and to rebuild the west approaches to the bridges the purpose of the work was to keep the channel of the stream within its established location.

Curbing Distinct from Sidewalks.—The charter of the city of Willmar, Minn., authorizes the city council to contract for the building and repair of such sidewalks as may be ordered by the council during the calendar year. The laying of curbing is authorized only after notice to and a hearing of property owners. The Minnesota Supreme Court held, in an action on a contract for the construction during the year of cement sidewalks, driveways, curbing and crossings [Nelson v. City of Willmar, 276 N. W. 234], that curbing is not incidental to or connected with the building and repair of sidewalks, and that the contract was void and unenforceable as to the curbing.

Plans and Specifications Should be Examined on Job.—Before submitting a bid on road construction work in response to an advertisement for bids by the State Department of Highways, the Virginia Supreme Court of Appeals says [Ragland v. Commonwealth, 200 S. E. 601], that the contractor should examine the plans and specifications at the place indicated. There is no obligation on the Highway Department to ascertain before accepting a proposal that the bidder has read and understands the plans and specifications under which he is bidding. After the specifications have been promulgated and advertised they cannot be changed or waived by the subordinate employees of the department. Having entered into a valid and binding contract with the department the contractor cannot claim payment on a quantum merit basis aside from the contract.

Maintenance Bond. — Kentucky Statutes, section 3571, authorizes a city to require a guarantee of street construction work for such time as the board of council may require in addition to the contract bond; and requires that the improvement shall be made according to the plans and specifications. In an action on such a street maintenance bond, the Kentucky Court of Appeals held [White Const. Co. v. City of Madisonville, 121 S. W. 2d. 55], that the fact that the city, by its representatives, supervised the work and accepted it is not conclusive as against defective material and workmanship as guaranteed by the maintenance bond. "It is common knowledge," the court said: "that there may be latent defects in such improvements which cannot be guarded against by casual examination of the work for the purpose of accepting or rejecting it, and the five-year guaranty or maintenance bond is authorized to guard against such latent defects. If the contract bond and the acceptance by the city of the work be conclusive against defects appearing within the five-year period, there would be no necessity for the maintenance bond."

Insufficient Advertisement. — The Wisconsin Supreme Court holds [Bechthold v. City of Wauwatosa, 280 N. W. 320], that a paving contract with a municipality was rendered void by failure to comply with the statutory requirement of publication of a notice advertising for proposals for the work "not less than once a week for two successive weeks." The contract, it was held, being void in its inception was not validated by performance. Whether the paving company could recover from the city for benefits received on the theory of unjust enrichment was a question not litigated or considered by the court. Taxpayers were held entitled to injunction restraining payment under the contract.

Ambiguous Contract.—One of the items of a highway contract was "4267.8 lin. ft. granite curb reset, 20 cents per lin. ft." Another was "71 lin. ft. granite curb removed, 20 cents per lin. ft.," subject to increased or decreased quantities of work at the contract unit price. The contractor claimed for extra work of removing 4,352 linear feet of granite curb at 20 cents per foot. The Georgia Court of Appeals held [Florence v. State Highway Board, 196 S. E. 86], that it was uncertain from the contract whether the provision requiring the contractor to reset the curb required him to remove the old curb. He should have been allowed to amend his petition to show his understanding of the contract as not including such removal; and to state that he informed the board of such understanding.

Savings on Coffins Can Pay for Sewer Systems

In making a study of the economic justification for a sewer system for Chungking, China, Col. A. B. Morril of the Public Health Service, reports in the *Engineering News-Record* that the savings in coffins, due to the reduced death rate from sewerage, would pay for the improvement in about 19 years. This is a new and dramatic way of stating the savings that modern sanitation can accomplish, and we congratulate both our good friends—the colonel and ENR on it.

The Philosophy of *Winter Maintenance*

Treatments for icy roads; procedure in snow removal; controlling traffic; money and time-saving equipment; and realistic information on handling the work.

By C. L. MOTL
Maintenance Engineer, Minnesota Department of Highways

WINTER MAINTENANCE consists essentially in keeping highways clear of snow, and in making them usable, within limits that are economically reasonable, during such times as they are subjected to ice formations and other slippery coatings.

Those who have had the most experience in organizing and administering winter maintenance programs realize that there is no such thing as a completely satisfactory program. They also realize that regardless of how much money is expended, it has never been, and never will be, possible to give this service with complete assurance that the highways will *always* be in good condition.

To those States where such a program has been carried out only on a minor scale and where better winter maintenance is being sought, it may be pointed out that better traffic service can be achieved through a greater and more intensive maintenance activity; however, as the program grows in scope and extent, and as the driving habits of the public assume a greater dependence on the winter maintenance program, the problem of maintaining a good reputation becomes increasingly difficult.

The Only Safe Road Is a Dry Road

There has been a great deal of discussion about making roads safe for winter driving, and much misunderstanding has developed in regard to achieving driving safety. A brief glance at the chart developed out of extensive tests conducted by The National Safety Council will show that no road coated with ice or snow can be a safe road, regardless of what artificial means are used to try to make it so. Fundamentally, the only safe road is a "dry" road; and any temporary efforts that may be undertaken to convert an icy road to a safer road may result in making the road more dangerous.

If reduction of serious accidents were the only consideration, the best procedure would be to keep roads coated with ice. Any city or state will, upon examination of its traffic records, find that the greatest freedom from deaths or serious accidents occurred at times when streets and highways were completely coated with ice. Some people were injured and there were numerous minor accidents, but the so-called serious accidents were almost totally absent. There are two reasons why this should be so: In the first place, many travelers stay home when roads are coated with ice; secondly, those who venture out, travel slowly and cautiously, because they must—they have no other choice.

Anything that is done to an ice-coated highway to give the traveler the impression that it is a safe road to drive on merely adds to the possibility of accidents. The average driver unfortunately considers a sanded road as good as a dry road. The chart discloses that a sanded road is still 50 per cent as bad as an icy road and four times as bad as a dry road.

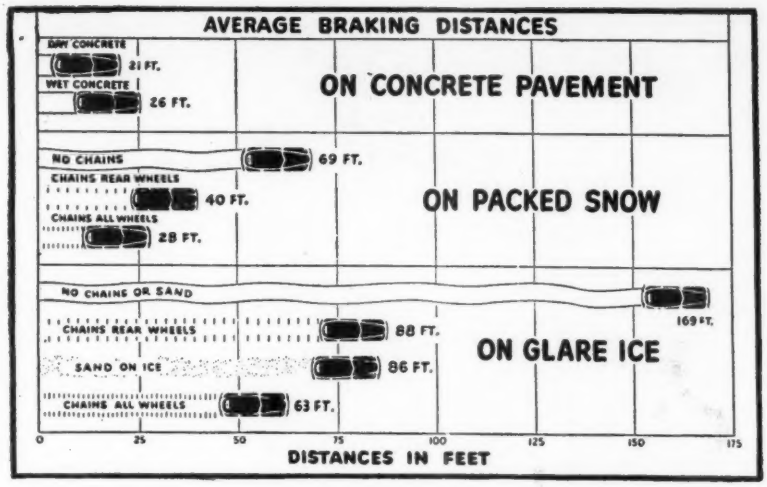
Methods of Treatment

If roads are to be sanded or otherwise treated for safety purposes, and for traffic utility, only the danger spots such as crossroads, stop crossings, railroad crossings, hills and super-elevated curves, should be sanded and treated. For the sake of greater usability it is often necessary to sand a road continuously, where traffic is of such density that continuous vehicle control is desirable and higher moving speed is necessary.

The use of chemicals for ice removal is being advo-

Snow removal by light-type equipment.

Two-ton truck, V-plow and wings.



This chart, showing average braking distances for automobiles on various surfaces is based on more than 3000 tests by the National Safety Council's Committee on Winter Hazards. Tests were made at 20 mph. Actual stopping distance is 22 ft. more than shown because of normal slow driver reaction. (Courtesy National Safety Committee.)

cated under some conditions, and is very effective; but, again, this type of cure is by no means 100 per cent successful, and introduces new problems. The use of raw chemicals on heavy coatings of ice can make conditions worse, instead of better, during the processes of removal. A layer of ice covered by a film of water is more slippery than a layer of dry ice.

Another method of attacking the ice coating problem has been through efforts for complete removal. So far no equipment has been developed that will successfully remove ice coatings completely under any and all conditions. Pressure blading, a process in which the moldboard of a heavy grader is sloped forward at a sharp angle (applying a rubbing pressure on the ice instead of a cutting pressure) has been giving good results. Because of the excessive pressures needed to shatter the ice, only the heaviest type of equipment can do the work successfully. A 10-ton motor grader equipped with a 4- to 6-foot cutting edge, and towed behind a truck, gives satisfactory results. All known processes intensively employed will still be incapable of coping with ice-forming problems under some circumstances. No State can possibly equip itself with an organization of standby equipment and personnel of sufficient magnitude to cover all its main highways in the short time if often takes "old man winter" to change highways from dry, safe, usable surfaces to icy and unsafe roadways. It is, therefore, unwise and inadvisable for any highway organization to announce that it can offer safe and continuous travel on the highways under any and all conditions.

The matter of snow removal, leaving out the occasional unusual storm, is growing to be the secondary problem in a winter maintenance program. While it is true that practically every State in the snow belt is occasionally visited by a snowstorm of unusual proportions and intensity, it would be economically unsound for any State to provide itself with standby equipment and personnel sufficient to cope with these occasional emergencies. Ordinarily when a storm of unusual proportions envelops an area, it so completely blocks all feeder roads and service roads that the main highways serve no real need for a few days after the storm.

The logical course to follow is to equip and organize for normal and slightly above normal conditions, and not be too concerned about the very unusual conditions. These come and go and are soon forgotten; and the money that would be spent on super organizations for very unusual storms, could be used to better purpose in some other highway activity. Millions of homes are being built—but not to withstand destruction by cyclone or tornado; therefore, why should the unusual storm that merely blocks our roads cause so much economic concern.

The Traffic Factor in Snow Removal

In a normal snow removal problem, the factor that causes the greatest difficulty is neither snow nor wind, but "traffic." The primary causes of roads becoming impassable are traffic blockades. There is nothing that a highway maintenance organization can do about vehicles that are ill-equipped to withstand the rigors

Heavy snow removal equipment.

Typical traffic blockade.

Industrial tractor and front-end loader.

of, or the troubles caused by, a snowstorm. Disrupted ignition, obstructed windshields, and other minor disabilities are usually the causes of the stoppage of traffic. With the stoppage of traffic comes the impossibility of operating snow removal equipment, drifting, collisions between vehicles, etc. During a storm of above average conditions, roads may become blocked with a tangle of vehicles, piles of snow and other obstacles that make it impossible for a maintenance organization to proceed with its work until the roadways are cleared of vehicles. As this seems to be the eventual possibility in any snowstorm, why wouldn't it be logical to close the roads against traffic when the possibility of blockades becomes imminent—why not discourage people from travelling while bad storms are in progress?

Experience in Minnesota has disclosed that opening a highway following a severe storm is a matter of only a few hours, except where obstructions prevent the normal processes of snow removal. With equipment stationed at intervals of 30 to 50 miles, it should be, and is, possible to cover the entire trunk highway system in a relatively short time, but when units of the snow removal organization are confronted with huge freight trucks piled up crosswise of the road, or cars stalled in snowbanks, attempts at equipment movement become futile.

There are times when traffic on highways during heavy snowstorms should be stopped, if possible. If this could be done in a practical manner, the cost of snow removal would be greatly reduced, and the overall usability of many roads would be increased. A few hours of closed roads during a bad snowstorm can pay dividends of several days of earlier use following the storm.

Better Equipment for Snow Removal

Much has already been said about equipment used for snow removal. What is desirable and effective depends upon the particular problem. At the present time, tools and equipment varying from a No. 2 hand shovel to a 500-h.p. combination truck and rotary, find a useful place in most snow removal programs. The perplexing problem is, what proportion of each kind of equipment available should be acquired and used in order to get the most effective results.

Since there will never be sufficient funds to provide all the equipment and personnel that would be desirable in a thoroughly effective snow removal program, it becomes necessary to make a practical choice that will take care of most situations at a reasonable cost. I believe this choice will be found to consist mostly in providing attachments for maintenance equipment useful for other than snow removal operations, such as dump trucks, motor graders, tractors, etc. This equipment supplemented by a wise choice of special heavy-duty units needed during emergencies, should produce a reasonable answer.

Under average, and even somewhat above average, snowstorm conditions, a light-to-medium truck covering a section of highway at frequent intervals gives better results than occasional plowing by a larger unit.

To avoid such expensive operations as hand shoveling, small tractors equipped with front-end loaders can produce astounding results when compared to hand shoveling. In considering the use of this type of equipment, competition with ½-yard full-swing power shovels must be forgotten if this type of unit is to be viewed in the proper perspective. These small units are intended to compete with hand shoveling and not with large power shovels.

In the matter of sanding equipment, there are now being manufactured, a number of units with mechanical devices for feeding the sand spreader. This is a big improvement over the former method of up-ending the dump-body or shoveling into the sand spreader by hand. One man provided with a stockpile of materials, a small tractor-front-end-loader, and a self-feeding sanding machine, can do as much as several trucks loaded and unloaded with the usual hand methods. In addition to this, the work can be done without the usual discomforts and dangers to men standing on a load of sand during unloading operations.

Reporting on Road Conditions

Reporting and forecasting road conditions should be a very important part of any winter maintenance program. It permits the public to be warned properly and the roads to be utilized to the best advantage. Regardless of how well a maintenance organization functions, there will always be places on the main highways where travel conditions are not of the best; and reminding the roadusers of these will keep them alert and mindful of the fact that safe and proper use of highways in the winter is, to a great extent, the personal responsibility of each individual operating a motor vehicle on them. Because of the news value of road condition and forecast reports, radio stations are glad to cooperate in spreading the information, especially if it is prepared in short releases which can readily be incorporated in and made a part of a news program. Forecasts of road conditions must necessarily be governed by information gathered from weather bureaus, and great care must be exercised in confining road forecasts to probable road conditions, and not to probable weather conditions. This distinction is very important.

The foregoing discussion may seem to leave the impression that a winter maintenance program is a rather hopeless effort in trying to provide the public with satisfactory roads. This is not the case; its intended purpose is to call attention to the need of exercising wisdom and good judgment in spending public funds in proper proportion to results that might be attained; and to impress upon the roaduser that his responsibility in using roads successfully during the winter months is as great or greater than that of the public official who is trying to provide them.

An Industrial Waste Summary Guide

The volume of wastes produced by various types of industries, their characteristics and population equivalents, and some data on methods of their treatment.

A "WASTE treatment guide" has been issued by the Interstate Commission on the Potomac River Basin which outlines the problems facing municipalities and industries in the control and abatement of stream pollution. While this guide discusses primarily the characteristics of the principal wastes which are, or may be, discharged into the Potomac or its tributaries, the information is equally applicable to other areas and is presented here in a slightly condensed form.

In order to prevent needless repetition of terms, the following condensations will be used: BOD for 5-day B.O.D.; TS for total solids; SS for suspended solids; VS for volatile solids; and PE for population equivalent. Unless otherwise stated, all numerical values are in parts per million. Also, all values given are approximate and subject to local conditions; therefore, the terms "about" and "approximately" apply in all cases unless otherwise stated. Discharge into a municipal sewerage system is nearly always a possible method of treatment, and will not be specifically mentioned; but in every case where this is proposed, the necessary pre-treatment requirements of the waste should be determined in order to prevent interferences with sewage treatment plant operation.

Bottling, Brewery and Distillery Wastes

Soft Drink Bottling wastes consist of washings from bottles and plant equipment, and contain sugars, syrups, washing compounds and dirt. For each 100 cases of the bottled product, 1500 gals. of waste is produced, having the following normal characteristics: BOD, 150; TS, 700; SS, 20; and PE 10 persons per 100 cases. The sugar content tends to deplete stream oxygen and is difficult to treat; with dilution, trickling filters can be used.

Brewery wastes are composed of liquids pressed from wet grain, liquid from yeast recovery operations, and wash liquor from brew, fermentation, storage and bottling. Volume varies from 180 to 1500 gals. per 31-gal. keg of beer, and has the following normal analyses: BOD, 400 to 1200; SS, 250 to 600; VS. 460; PE, 15 to 25 persons per 31-gal. keg. Solids form sludge banks, which decompose; the organic material in the liquid depletes stream oxygen. Treatment may be by fine screens to remove suspended solids, settling, digestion of the solids, and treatment of the settled liquor by trickling filters or activated sludge.

Distillery wastes result from the fermentation and distillation of corn, rye and malt to produce whiskey, and of molasses and cane syrup to produce rum and alcohol. These wastes have a high organic content and contain much material in both solution and suspension. The solids form very unstable sludge banks. Volume of wastes varies greatly—from 45 to 600 gals. per bushel of grain used, and 80 to 120 gals. per gal. of 100-proof alcohol produced. Characteristics are: BOD, 250 to 35,000; SS, 200 to 2300; TS, 740 to 48,000; and PE 1 to 12 persons per gallon of 100-proof alcohol produced. Treatment may include screening; evaporation of liquids and recovery of solids for stock food; discharge into lagoons; and settling, followed by biological treatment on trickling filters, with solids digestion.

Table 1.- Approximate Volume and Strength of Various Canning Wastes per 100 Cases of No. 2 Cans per Day.

Product:	Gals.	BOD	Solids	PE
Apples	. . .	2,700	250	. .
Asparagus	7,000	100	30	35
Beans, Pork and	3,500	925	225	160
Beans, Green	3,500	200	60	35
Beans, Lima	25,000	190	420	240
Beets	3,700	2,600	1,530	480
Carrots	. . .	1,110	1,830	. .
Corn, Cream Style	2,500	620	300	75
Corn, Whole Kernel	2,500	2,000	1,250	250
Cherries	1,200	1,400	. .	75*
Grapefruit Sections	5,600	1,850	270	520
Grapefruit Juice	500	310	170	8
Peaches, Pears	6,500	1,340	. .	440
Peas	2,500	1,700	400	210
Pumpkin, Squash	2,000	5,100	1,480	640
Sauerkraut	300	6,300	630	100
Squash	2,000	6,000	3,500	180
Grapes	. . .	720	1,650	. .
Spinach	16,000	615	. .	490
Succotash	12,500	525	250	330
Tomatoes, Whole	750	4,000	2,000	150
Tomato Products	7,000	1,000	500	350

* Per ton of cherries; BOD is 5-day; PE is persons per 100 cases of No. 2 cans produced per day.

Pulp, Paper, Sawmill and Lumbering

Pulp wastes arise chiefly from the digester liquors; barking and chipping; and screens, rifflers, knotters, thickeners and bleach. They contain chemicals used in these processes, lignin salts, wood sugars and fibers. From the *paper* machines, the wastes include short fibers, mineral filler, dirt and dissolved organic matter. These wastes create turbidity in the stream, form sludge banks, and deplete stream oxygen; they also may cause undesirable acidity or alkalinity, and color, and are deadly to fish. Volume ranges from 6,000 to 80,000 gals. per ton of paper produced. Characteristics are: BOD, 20 to 900; SS, 150 to 2000; TS, up to 110,000; PE, 25 to 1600 persons per ton of paper produced per day. Treatment may include the use of save-alls, screening, evaporation, chemical treatment and settling; and lagooning.

Sawmill and Lumbering wastes are primarily sawdust and bark which may be discharged into a stream or wash into it; the wood sugars, lignin and tannin extracted by the water add to the problem. Sawdust banks and suspended sawdust are deadly to fish. There are few data on the volume and characteristics of this kind of waste. Treatment is primarily preventive, by denying access of sawdust and bark to streams

Table 2.- Approximate Volume and Strength of Dairy Wastes per 1,000 Pounds of Milk Received per Day.

Type of Plant	Gals.	BOD	SS	PE
Receiving Station	175	500	. .	4
Bottling Works	250	. .	. .	6
Cheese Factory	200	1,000	750	16
Creamery	110	1,250	660	6
Condensery*	150	1,300	750	7
Condensery**	1,500	. .	. .	. .
Dry Milk Plant	150	480	. .	6
General Dairy	340	570	540	10

*Exclusive of vacuum pan water;** vacuum pan water per 1,000 pounds of condensed milk daily. These data from U. S. Public Health Service.

and by subsurface or other disposal of sawdust pile drainage.

Canning, Dairy and Laundries

Canning plant wastes consist mostly of the wash water used to clean the raw product, plus the water used for washing floors and equipment. The waste contains particles of the skins, seeds and hulls, and usually juice. Volumes vary greatly. Table 1 shows the approximate strength and volume of various canning wastes. Treatment may be by lagooning; irrigation; settling, following by sand beds, trickling filters or activated sludge; and fine screening and high rate filtration.

Dairy wastes consist of dilutions of whole milk, skim milk and buttermilk from spills, drippings and waste; wash water containing various chemicals; and wash water from cans, bottles, vats and equipment. Volume, characteristics and population equivalents are shown in Table 2.

Laundry wastes consist of dirty water from the washing machines. This is highly alkaline, colored and turbid, and contains soap, soda ash, grease, dirt, dyes and lint and cloth particles. It forms sludge banks and scum and causes turbidity in a stream. Volume varies from 350 to 500 gals. per 100 pounds of wash. Characteristics are: BOD, 1,000 to 1,500; TS, 1,500 to 2,500; VS, 800 to 1,200; SS, 400 to 600; grease, 400 to 500; PE, 4.5 to 6.5 persons per 100 pounds of wash per day. Treatment may be by chemical precipitation, with sludge disposal to lagoons or on sand beds; or sedimentation, followed by trickling filters or activated sludge, with digestion of the solids.

Slaughterhouse, Meat Packing and Tannery Wastes

Slaughterhouse and packing wastes consist of the water used for washing purposes, and contain blood, grease, manure and particles of meat. Volume varies from 15,000 to 80,000 gals. for each 100 hogs or cattle killed. Characteristics are: BOD, 900 to 2,200; SS, 650 to 950; TS, 3,500 to 4,500; PE, 1,800 to 2,400 persons for each 100 hogs or 40 cattle killed per day. Recovery and use of wastes; lagooning; screening; settling, with digestion of sludge, and trickling filters or activated sludge; and chemical precipitation, are possible methods of treatment.

Tannery wastes include wash water from green hides, wastes from liming vats and dehairing machines, wash water from fleshing and graining, exhausted or spent tan liquors, and water from general washing. The wastes contain salt, dirt, manure, blood, lime, hair, fat, pieces of meat, vegetable tanning material, chromium and aluminum salts and various dyes. Volume varies from 300 to 1,700 gals. per 100 pounds of raw hides, averaging about 800 gals. Characteristics: BOD, 600 to 2,500; TS, 4,000 to 12,000; SS, 1,000 to 2,5000; VS, 2,000 to 5,000; color, 500 to 5,000; and PE, 48 persons per 100 pounds of raw hides for vegetable tanneries and 24 persons per 100 pounds per day for chrome tanneries. Treatment may include screening; condensing and evaporation; settling in basins, tanks or lagoons; chemical treatment; and sand beds, trickling filters or activated sludge.

Rayon and Textile Plants

Rayon wastes from viscose rayon manufacturing contain caustic soda, viscose and hemi-cellulose; wastes from spinning and related departments contain sulphuric acid, viscose, glucose and sodium and sulphur compounds; wastes from yarn finishing contain fibers, sodium polysulphides, weak acids, soaps and oils; wastes from acetate rayon contain acetone, acetic acids, hemi-cellulose, cellulose acetate and other chemicals. Volume varies from 2,000 to 5,000 gals. for each 100 pounds of rayon produced. Characteristics are: BOD, 20 to 500; TS, 500 to 5,000; acidity, 25 to 2,000 ppm.; PE, 4 to 100 persons per 100 pounds of rayon produced. Chemical treatment, settling, and trickling filters are used.

Textile wastes may be from wool, cotton or silk. Wool scouring waste is yellowish and turbid and contains heavy mineral matter, dirt, manure, wool fibers, wool grease and detergents. Cotton kiering waste contains natural vegetable fats, waxes, resins, fragments of cotton bolls, cotton fibers, starch and other sizing material, caustic soda, soda ash and other chemicals and oils. Silk degumming wastes include silk gum, organic material, soap, sodium silicate and other alkalies. Other wastes formed in bleaching, mercerizing, silk weighing, carbonizing and dyeing contain acids, alkalies, metallic salts and dyes. Volume is generally 1,000 to 2,000 gals. per 100 pounds of product. Characteristics vary greatly; a general range for dyeing operations may be: BOD, 100 to 30,000; TS, 1,000 to 50,000; SS, 100 to 30,000; oils and grease, up to 25,000 ppm.; PE, 6 to 44 persons per 100 pounds of product dyed. Disposal methods include: Screening, settling, chemical treatment, aeration, sand beds, trickling filters and activated sludge; and also lagooning, evaporation and seepage.

Other Wastes

Quarry and Sand Washing wastes result from washing the aggregate and contain dirt, clay, fine sand and small stone. No information is given as to volume, but sand and gravel plants will use about 10 gals. of water per cubic yard of material produced. Waste may contain up to 20,000 ppm. of solids. Sedimentation is desirable before discharge into a stream.

Mine wastes consist of acid drainage from active and abandoned mines, and washings from coal preparation plants. The former contain sulphuric acid and iron salts; the latter, silt, sand and fine coal. Volumes are variable; TS, 5,000 to 70,000; acidity, up to 48,000 ppm.; sulphates, up to 42,000 ppm.; total iron up to 12,000 ppm.; PE, 4.5 to 1,300 persons per acre of mine plants and 360 to 550 persons per ton of coal processed daily by coal preparation plants. Mine drainage can be neutralized with lime, but the cost is high; sealing of worked out and abandoned mines is the standard method of treatment. Wastes from coal preparation plants may be settled.

Chemical plants vary so widely that each one is a separate problem requiring individual study.

Gas Producing plant wastes originate in the am-

(Continued on page 44)

How Radiotelephone Helps in Highway Maintenance

This is a continuation of an article in our September issue which illustrates the increased efficiency obtainable by the use of the radiotelephone.

By FRED E. EBEL

Richard Linton, maintenance engineer of the Wenatchee district, with more than 1,000 miles of highway is enthusiastic over the role 2-way radiotelephone has played in his area of operation. He tells of a radio-equipped truck which tipped onto the road. The driver radioed for help and in 20 minutes the truck was righted. "If it hadn't been for radio," says Linton, "it would have taken at least 6 hours to do this job." Sometimes, according to Linton, a minor breakdown of equipment on the road can be remedied by the men themselves by means of instructions raidoed.

"Radio," adds Linton, "also permits us to work 'on the fly.' Suppose, for example, that a foreman driving on a busy highway notices that a post needs repairing. He doesn't have to stop, hunt up a telephone, and in the meantime create a traffic hazard on a heavily traveled highway. He simply picks up the microphone and transmits the location and nature of the trouble." Recently a "cat" tractor was reclaimed from a ditch; 2-way radiotelephone made it possible to restore this non-expendable piece of equipment to work in a fraction of the time it would have taken had radio not been available.

Slippery road conditions on hills are danger zones unless promptly sanded. A highway radio-equipped patrol car makes it possible quickly to notify the dispatcher of the troublesome condition. A sand truck can be speedily dispatched to the location thereby removing a traffic hazard before a mishap occurs.

The 2-way radiotelephone has lightened the office load and speeded up administrative details. "We find," says Linton, "that radio has greatly clarified our paper work. There's no lengthy exchanges of letters. Orders given to men are acknowledged immediately. Of course, this also cuts down our need for stenographic help."

Another district handling volume highway traffic has its headquarters at Ellensburg, approximately at the geographic center of the state. Here from a remotely controlled 250-watt FM Motorola transmitter atop Craig Hill at the edge of town, messages can be flashed 85 miles northward over 7,000-foot mountain peaks into the city of Wenatchee. Snoqualmie Pass summit, 65 miles northwest, is also "covered" by this Kittitas Valley station.

Other Ways That Radio Helps

Victor Marshall, superintendent of the district, has a host of stories illustrative of the many ways 2-way radiotelephone has expedited maintenance duties. Radio, for example, has helped justify the "open year around" slogan of Snoqualmie Pass. Some 2,385 vehicles daily wind through the modern 35-mile highway at so gradual a grade as to pass unnoticed by the average motorist. Trucks pass with freight averaging 2,500 tons per 24 hours. To the Highway Department goes the responsibility of keeping open this life line that connects eastern and western Washington.

A 2-way FM radiotelephone on a road maintenance truck.

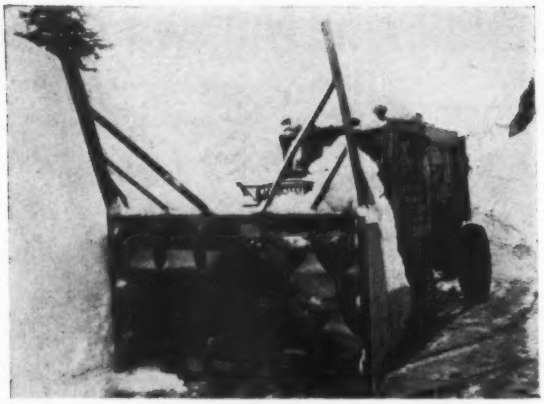
January and February finds snow crews working "round the clock." Radio-equipped push plows and those spectacular "follow-uppers," the rotaries, must sweep off the pass, keeping in touch with each other and with headquarters, so that each unit can operate in the most efficient manner.

A breakdown of one of these snow fighters is just cause for alarm. Every possible means must be employed to restore the equipment to operation. Snow on the road not only jeopardizes the safety of the motorist but also paralyzes valuable and vital freight shipments.

With 2-way radiotelephone it is not necessary for the driver to leave his cab and walk down the mountain to a telephone to order repair service. He simply uses the transmitter-receiver unit on his equipment. If the trouble is of a simple nature he can fix it himself from a few instructions. "But," says Marshall, "even if we have to deliver the parts we still save 8 to 16 hours through the use of radio."

A short time ago a snow plow was hit by a bus, killing a man. The snow plow operator informed headquarters immediately of the tragedy. The time of the message was 1:45 P.M. At 1:46 P.M., one minute later, an ambulance and a patrol car left for the scene of the accident.

Two incidents which further serve to establish the effectiveness of 2-way radiotelephone in expediting maintenance operations had their locale at Wymer Cut, near Roza Dam. A power shovel engaged in the road widening project became inoperative due to engine trouble. A section man, utilizing the radio on his pick-



Snogo operates under radiotelephone direction from headquarters.

up truck, radioed to Ellensburg. There the dispatcher contacted Yakima and requested that a mechanic be sent immediately to the breakdown scene at Wymer Cut. In 30 minutes the mechanic arrived, and shortly after the shovel was in operation again.

Marshall and his men are especially proud of an incident best described as in "the Public Interest, Convenience, and Necessity." On April 18 a rock slide at Mymer Cut blockaded school children en route to a music contest. A section man in charge radioed the information to Ellensburg, where the disappointing news was brought to the attention of school authorities. Soon after, however, it was the dispatcher's pleasant duty to inform the sectionman that the music contest had been postponed to the next day. "Were those kids relieved," says Marshall. "And so were the relatives and friends of those kids. If it hadn't been for radio they wouldn't have known what had happened to the children."

Though Clarence B. Shain and James H. Marshall, maintenance engineer, have the most modern and comprehensive of all highway 2-way FM radiotelephone systems, plans are already under way toward making the communication network even more efficient. Contemplated for early installation are stations at Seattle, Bellingham, Shuksan, Republic, Colville, Spokane, Colfax, Davenport, Ritzville, Pasco, Walla Walla, and one near Chinook Pass.

Mobile units for cars and heavy equipment will probably reach the hundred mark sometime this year. Both main stations and mobile equipment will employ Mortorola FM gear. The use of frequency modulated equipment permits life-like clarity of speech and static-less reception, desirable in areas visited by lightning storms.

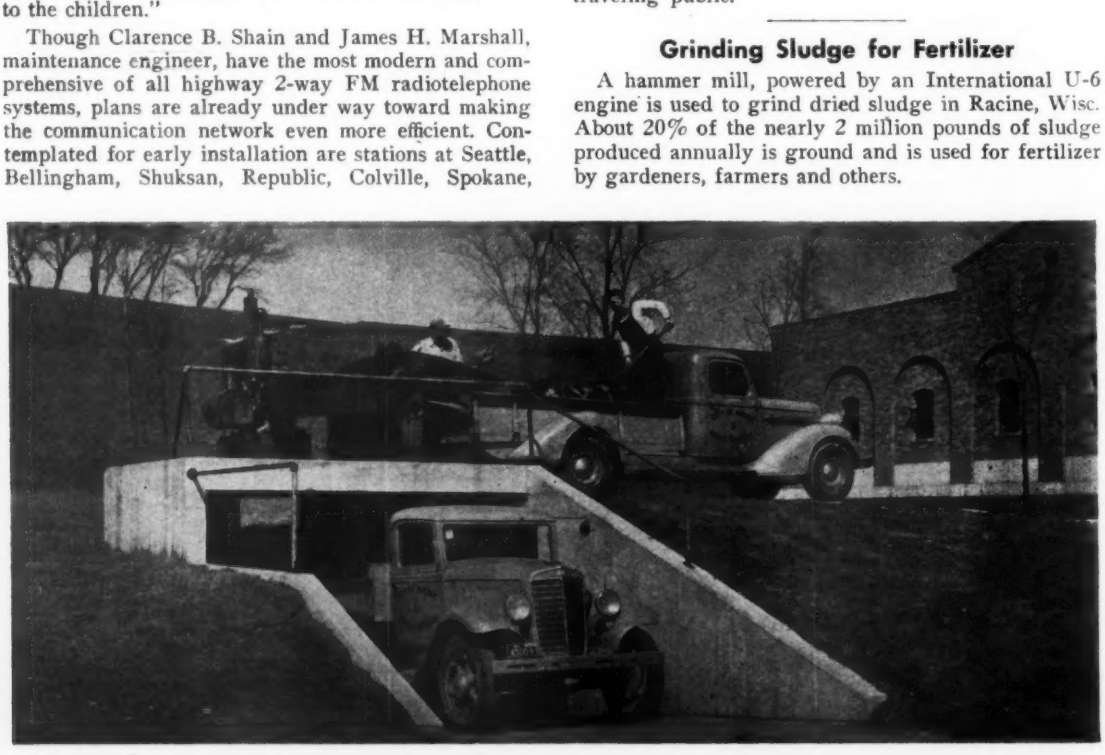
An interesting radio "repeater" link will make possible 2-way radiotelephone communication between Olympia and Spokane—a 360-mile jump across the state. Radio engineer Lewis intends to reinforce the signal with very high frequency repeater stations at Snoqualmie Pass and some high point in the Columbia Basin. These stations will be "triggered" or switched on by the radio wave itself. No personnel whatever will be required at these radio remote control transmitters.

Radio maintenance cost has been conspicuously low. "So little maintenance has been required," says Lewis, "that we have had but one man detailed to do this work." A large number of units, fixed and mobile, have given six months of uninterrupted service with no attention. This has been a necessity where fixed stations are almost inaccessible during the snow season. At Snoqualmie pass summit, for example, 5000 feet of telephone wire stretches up wild mountain slopes to the top of a peak described by hardy natives as "pretty rugged." "Equipment that will operate unattended for months at a time is a necessity for these installations," says Lewis.

"It is difficult," says Director Shain, "to make an estimate of the actual saving of time or of dollars and cents through the use of 2-way FM radiotelephone. However, radio does enable the Department of Highways to give a much faster and better service to the traveling public."

Grinding Sludge for Fertilizer

A hammer mill, powered by an International U-6 engine is used to grind dried sludge in Racine, Wisc. About 20% of the nearly 2 million pounds of sludge produced annually is ground and is used for fertilizer by gardeners, farmers and others.



The Racine, Wisc., set-up for conditioning sludge for fertilizer.

Operation Data on Sewage Treatment at Detroit

The annual report for the fiscal year contains information on pumping, screenings and grit removal, sedimentation, digestion and sludge filtration.

THE average amount of sewage pumped daily in Detroit, Mich., during the 1946 fiscal year was 329 mgd., compared to 315 mgd. in the preceding year. A year's trial of grinding the rakings and returning them to the sewage flow has indicated that this method warrants further use and improvement. The rapid dulling of the hammers is being solved by adding a hard coating to the wearing edges. This should cut rags fine enough to prevent them from being caught a second time on the screens. A total of 80 tons of screenings was sent to the incinerators direct during several experimental periods.

Grit amounted to 21,293 wet tons, an increase of 46.3% over the previous year. This increase is attributed to: The greater use of cold patches for street repairs, increased vehicular traffic, accelerated construction activity with its new sewer connections, and storage of building materials along curbs. Grit contained 47.4% of solids, of which 37.8% were volatile.

All eight sedimentation tanks were in use, except for periods of repair and observation, providing an average detention of 1.40 hours. There were numerous instances of sheared drive pins, due primarily to a shortage of ferric chloride which resulted in overloading the collectors with accumulated sludge. More skimmers were added to the grease equipment, and the speed was increased on one unit to accelerate collection. The frequent plugging of the grease pumps remains a major problem, due to the sticks and timbers, some as large as 2"x4", which are picked up. Screens, with openings as large as 3 ins. have been tried in the collecting hoppers, in an effort to eliminate clogging from the sticks, but they seal over quickly. Efforts are being made to work out some way of grinding the sticks. In the sedimentation tanks, suspended solids removal averaged 54.5% — from 255 ppm. in the influent to 116 ppm. in the effluent; BOD removal averaged 39.3%—from 132 ppm. in the influent to 80 ppm. in the effluent.

Cleaning the Digester

The digester was drained of all liquid in June (1945) and the remainder of the matted material was pumped out with much difficulty during the following month. All the metal framework was found to be in good condition, having accumulated a protective lime-like coating during its five years of use. The under side of the floating cover was likewise well protected by the oil which had risen to the top of the sludge. In refilling the digester, raw sewage was first added until the cover floated, then seeded sludge, and finally raw sludge. By the time the heating boilers were ready to go into service, enough gas was available for this purpose. A piping change was made to permit feeding and drawing off sludge at the same time. The average loading rate on the digester was 5.5 lbs. per cu. ft. per month. The raw sludge going to the digester contained 9.1% of solids, of which 65% were volatile. Digester supernatant contained 6.1% solids, 53.8% of which were volatile.

Gas production amounted to 6.1 cu. ft. per pound of solids added, or 9.25 cu. ft per pound of volatile solids added. The boilers operate almost exclusively on digester gas; fuel oil was required only during repairs to the gas blower or gas line.

Continued experimentation with the sludge filtering equipment is producing greater production with less usage of chemicals. Lime percentage has dropped for the third consecutive year, this time from 7.0% to 6.7%. Filter cake yield has increased from 6.8 to 7.0 pounds per sq. ft. per hr. Ferric chloride dosage has increased from 2.08% to 2.31%. Equipment is being installed to dilute the ferric chloride with water just prior to use. This will permit more accurate dosage and better dispersion in the sludge. Changes are being made in the vacuum filters including: Large drains on the moisture traps, splitting of the vacuum system to permit work on one-half at a time, and connection of the filter pan drains direct to the yard sewers. Experiments have been made with small areas of filter cloth woven from plastic threads, but results from the first trials were not very encouraging as the mesh filled quickly with lime deposits.

To increase incinerator capacity, storage bins and screw feeders were installed on two of the four units. A variable deflector plate was added on the top hearth of incinerator No. 5 to spread the cake more evenly. This plate along with a larger by-pass drop hole permits additional feed and fire control, and has resulted in more uniform temperatures.

Linear travel speeds were reduced about 28% on some of the rubber conveyor belts to reduce the wear caused by the scraper and thus prolong their life. Side skirt plates were removed where possible and spread where additional capacity was required. The two ash sluicing pumps were taken out of a pit and installed on the floor level, to permit better operation with less maintenance cost. The filter room was heated for the second year by the warm air from the incinerator central shafts. Fuel oil consumption decreased from .14 to .08 gallons per wet ton of sludge incinerated, a drop of 42.8 per cent.

The average chlorine demand of the sewage dropped from 8.24 to 7.77 ppm.; the total amount of chlorine used decreased 11.8 per cent. This reduction was largely due to curtailed applications during the winter months.

Flies, mosquitoes and other insects were successfully combated in certain areas of the plant by the spraying of DDT on walls and ceilings.

A metallizing spray-gun was purchased during the year. Its use has simplified several maintenance jobs and reduced the costs on others.

The increasing amount of firebrick work made it necessary to purchase a masonry saw with which to cut the blocks. Its use has speeded up the work and produced better fits between blocks.

Public Works Engineering Methods and Data

Chlorination Helps Restore Capacity of Little Rock Main Supply Line

The application of breakpoint chlorination to eliminate and control organic growth in the 39-inch pipe line of Little Rock, Ark., and to re-establish the designed carrying capacity of the line was continued throughout 1946, according to the annual report of the Water Department. Three carrying capacity tests were performed during the year, all tests indicating that the pipe line was giving satisfactory performance.

Break-point chlorination has been applied to the line for the past seven years for control of organic growth. During this time results indicate that most of the lost capacity has been restored and that continued treatment can control future growth. Some material still clings to the inner surface of the pipe and the removal of this by some mechanical means may be necessary to restore completely the 25 million gallons per day designed capacity of the pipe line.

A Design for a Wading Pool

A wading pool adds greatly to the attractiveness of playgrounds and parks used by small children. It is generally preferable to make a wading pool separate from and independent of a swimming pool. And two pools are better than one, especially if they can be located in different parts of the community. The accompanying plan of a rectangular wading pool is from *Concrete Swimming Pools,* a publication of the Portland Cement Association, and the data herewith are abstracted from the same source.

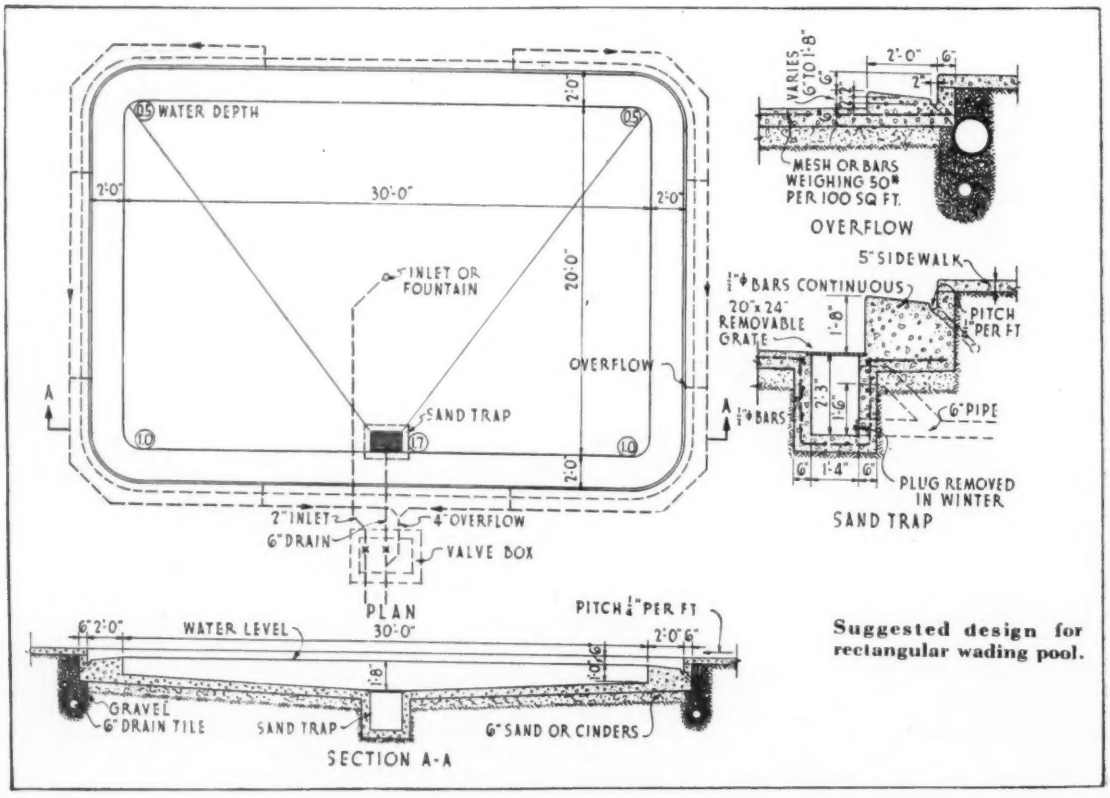
The floor of the pool may slope gradually to above the water line or may have a low curb, giving a water depth of about 6 ins. The maximum depth should not exceed 24 ins. The bottom slope should not exceed 1 to 15. Since the quantity of water is small, the contamination high, and a considerable amount of sand and debris are carried into the water, a fill-and-draw system is preferable to recirculation through a filter, and a flowing through system may be better yet, particularly where the load is heavy. Even with the flowing through system, it is advisable to clean and drain the pool daily.

Because of the large amount of sand and debris, it is necessary to provide simple and accessible sand traps in the drainage system. Shower or fountain sprays make good inlets.

Refuse Incineration Data

The annual report of the Bureau of Sanitary Engineering of the Maryland Department of Health summarizes the 1946 operation of several incinerator installations in that state as follows:

The 60-ton refuse incinerator at the Frederick sewage works burned a total of 4,884 tons of mixed garbage and rubbish and 1,685 tons of sewage sludge during the year. Since the incinerator normally oper-



Suggested design for rectangular wading pool.

ates six 8-hour days each week, the average daily amount of mixed rubbish and sludge consumed was 15.6 and 5.4 tons, respectively. This total of 21.0 tons of material consumed each 8-hour day indicates the incinerator is now operating at approximately design capacity during the 8-hour operating period.

At the 600-ton Reedbird Avenue incinerator of Baltimore City, a total of 145,469 tons of mixed rubbish and garbage were consumed of which 41.0 percent was garbage and 59.0 percent rubbish. The incinerator ash showed an average of 1.48 percent combustible material with maximum and minimum monthly averages of 3.52 percent and 0.85 percent respectively. For the year a daily average of 572 tons of mixed garbage and rubbish were consumed for an average plant capacity rating of 95 percent.

The new 150-ton incinerator at Lyttonsville of the Washington Suburban Sanitary Commission, the first of this design constructed in Maryland, went into operation in July, 1946. A total of 9,297 tons of garbage and trash was consumed during the period of operation. The total cost of operation was $2.41 per ton which includes $1.12 per ton for carrying charges. The latter figure was for the entire year although the incinerator was not placed in operation until July. The incinerator serves a population of over 50,000 persons in Montgomery County.

The 70-ton incinerator at Bladensburg operated by the Washington Suburban Sanitary Commission, destroyed a total of 14,435 tons of combustible trash. A total of 6,580 tons of non-combustible material was also handled at this incinerator. The cost of incineration, including overhead and carrying charges, was $2.04 per ton with the furnaces indicating a capacity rating of approximately 70 percent.

Water Repellents for Soils

Materials have been developed which, when added to some types of soils, appear to have the property of repelling water, or of waterproofing the soil. Some of these materials were used in road and airfield construction during the war. A study, made by the U. S. Waterways Experiment Station, and reported in TM 217-1, has been summarized in Highway Research Abstracts, from which the following information is taken.

Field investigations showed that all untreated uncovered soils rutted badly when wet, while the treated uncovered soils showed a very material improvement over the untreated uncovered soils. Tests were also made with PSP, or pierced steel plank, and PBS, prefabricated bituminous surfacing, as cover. THE PSP comes in sections 1¼'x10', weighing 64 lbs., and is much the same as the material used by the Air Forces for steel landing mats. PBS is an asphalt impregnated and coated fabric, usually burlap, with a weight of 0.39 lb. per sq. ft.

Untreated soil covered with PSP is better than uncovered untreated soil, but its performance was only fair. Treated soil was no better than untreated soil when covered with these planks. The PBS gave better results with treated than with untreated soil, and better results under both conditions than the PSP. No data were obtained on the results in high ground water areas or under freezing conditions.

Rotary mixing equipment was found to be superior to discs, harrows or blades for mixing most soils with water repellents. In very plastic soils, a combination of discs, harrows and rotary equipment appears necessary; and in heavy clay soils, sheepsfoot rollers may

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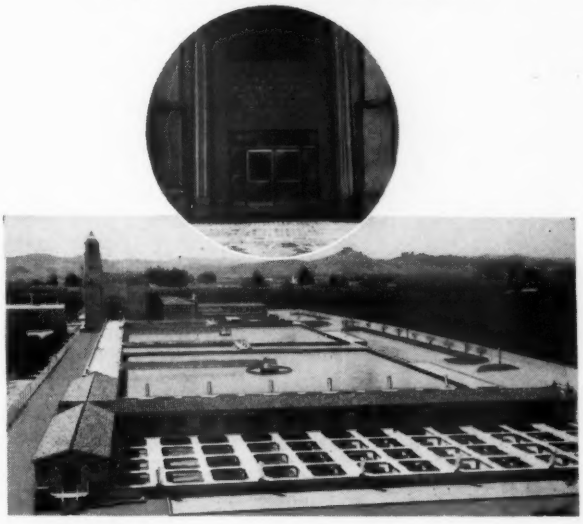

The Metropolitan Water District of Southern California in doubling the capacity of its water softening and filtration plant at LaVerne, California, opens its doors again to Builders Equipment. The new 100 m.g.d. addition, like the original plant, will have Builders Gauges, Controllers, Diaphragm Pendulum Units, and Master Controls.

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be advantageous. When the water content of the soil is too high, it is desirable to apply the repellent just as soon as the mixing equipment can operate, as this permits more rapid ultimate compaction and meanwhile provides protection against rain.

The permanency of the waterproofing effect of these water repellents was not determined. Tests were made on Vinsol, NVX, Stabinol, 321, NSP-121 and NSP 25-2.

There is no simple laboratory test that will determine if a specific repellent will work or will provide a close guide to the amount required to waterproof satisfactorily a given soil. The value of the pH test was not conclusively shown. For use in theaters of operation, it is recommended that reliance be placed on soil classification tests and the plasticity index. Repellents are not recommended for clean cohesionless sands. For other types of soils, approximate recommended treatment with Stabinol is as follows: Silty sands, sand silts and silts, PI 2 to 6, 2% of Stabinol; sandy and clayey silts and silty clays, PI 6 to 20, 1%; silty clays and medium to fat clays, PI 20 and above, 2%; sand clays, clayey sands, gravelly clay sands, etc., PI 4 to 12, 2%. The percentages of Stabinol shown are on the basis of the dry weight of the soils.

Water Supply and Sewerage for Housing Projects

Housing construction in Maryland has involved many groups of houses, some of which did not have access to water or sewerage facilities. Where possible, sewers were installed; otherwise a septic tank with subsurface disposal was installed for each home where the soil was suitable. Where comparatively small lots only were provided and individual sewage disposal systems had to be installed, the Bureau of Sanitary Engineering of the State Department of Health insisted that a safe and adequate community water system be installed. It was deemed impossible, on these small lots, to have wells and septic tanks side by side without dangerous contamination resulting. Where a community water supply was not possible, minimum lot sizes were required in order to provide adequate separation of sanitary facilities. Where less than ten homes were involved, the project was referred to the County Health Department for review.

Effects of Atomic Bombing on Sewerage and Refuse Collection in Hiroshima and Nagasaki

In a previous issue of Public Works Magazine the effects of the atomic bomb explosions on the water supply facilities of Hiroshima and Nagasaki were summarized. Effects on sewerage and refuse facilities were less marked and are rather difficult to interpret in the light of conditions in the United States, primarily because of the wide differences between Japanese and American practice.

Sewerage

Damage to sewage pumping stations and control gates was reported. However, this affected storm drainage almost exclusively because there are few, if any, households which discharge excreta to the sewer system. In Hiroshima there were approximately 80,000 houses using privies. Collections of night soil were made from these by the city or, in about 30% of the cases, by farmers. Collections by the city were made twice a month, and averaged 48,000 gallons per month. The material was stored in 20 concrete tanks, each holding about 64,000 gals. It was customary to retain

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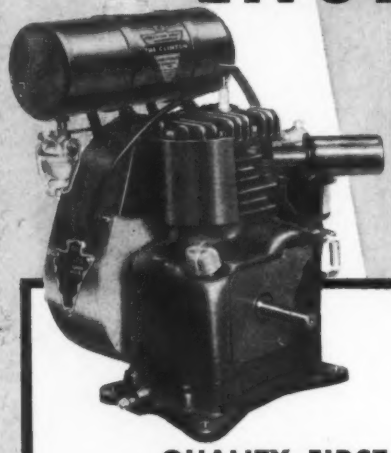

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the material for about 30 days, after which it was delivered to farmers by boats or trucks. The storage tanks were not damaged by the bomb blast, but collection equipment was destroyed and the boats damaged. Official recommendations were therefore made that the night soil should be used as a fertilizer on war gardens within the city, generally by each householder.

Prior to the bombing, there were 46 public comfort stations, but none of these was connected to the sewers. Many of them were damaged and replaced, in part, by crude types of structures.

In Nagasaki, the situation was much the same. The city had no sewerage system other than street gutter drains for the collection of run-off water, but these drains were also used for laundry and similar wastes, excepting fecal material. Prior to the first aerial attacks, the night soil was collected by a contractor and hauled to rural areas where it was sold to farmers for fertilizer. The bombing destroyed the collection equipment. Thereafter, householders had to remove the material from the toilet vaults and bury it or use it on their gardens.

Refuse Collection and Disposal

A garbage and trash collection service was maintained in Hiroshima by the city prior to the bombing on a once or twice a week schedule. Disposal was by dumping on low lands, one dump being located in each of the five collection areas of the city. From time to time, the rotted garbage was disposed of to farmers for fertilizer. Collection equipment was destroyed by the bombing and no attempt had been made to resume service in the undestroyed area at the time of the survey. Disposal of garbage and refuse thus became the duty of each householder. In Nagasaki, before the bombing, 60 city employees collected refuse twice weekly, using about 50 open 2-wheeled carts. From 90 to 100 tons were collected daily, or about three-fourth pound per person per day. Most of the material was inorganic. Many of the vehicles were destroyed by the bombing, and collections were discontinued. At the time of the survey, 6 vehicles and 20 workmen were available. In the meantime, disposal was by dumping in vacant areas or burning.

These data are summarized from a report by the United States Strategic Bombing Survey "The effects of Atomic Bombs on Health and Medical Services in Hiroshima and Nagasaki."

Water Treatment and Water Quality in Washington

Statistics of interest in regard to water treatment and water quality were contained in the annual report of the Sanitary Engineering Division of the Washington State Health Department. There are 557 water supplies in the state, serving a population of 1,637,870. Of these, 307 supplies are untreated ground water and 8.9% of the samples were unsatisfactory bacteriologically. The 39 supplies using treated ground water, in all cases chlorination only, had 2.5% unsatisfactory samples. Of 85 supplies using untreated surface water, 33.5% of the samples were reported as unsatisfactory. The 126 treated surface water supplies showed only 1.6% unsatisfactory. Speaking of these supplies, the report states: "The relatively high occurrence of positive samples of treated ground water (2.5%) is due to the fact that these supplies are generally small, and consequently disinfection processes do not always receive the necessary attention."

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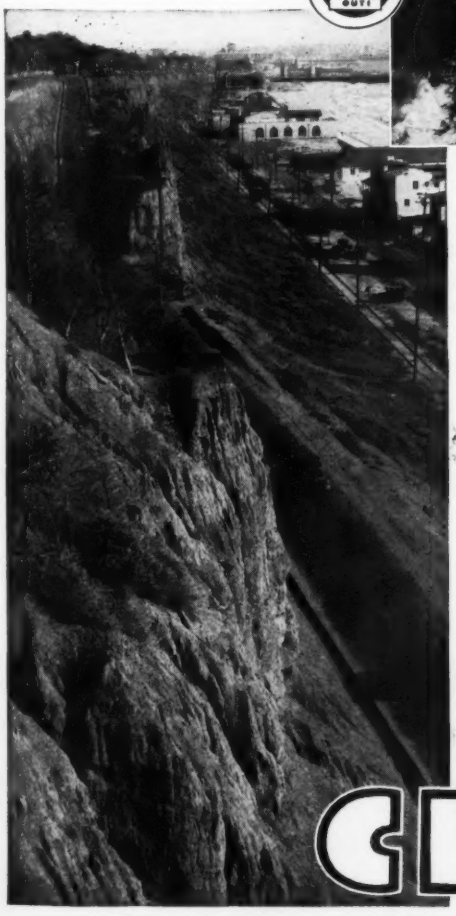

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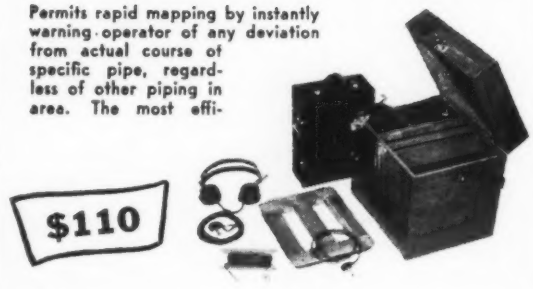

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Solving Ice Control Problems

Procedures and experiences in Michigan, based on a paper presented at the American Road Builders' Association meeting.

By R. B. DOWNEY, MAINTENANCE ENGINEER

Michigan State Highway Department

A dry road in winter time is safe.

PROBABLY the most usual ice control problem results from snow packed on the pavement. The thin layer of snow left by many types of snow plows creates no particular problem when the weather is cold; but when rising temperatures or traffic loads turn the snow into ice, the situation becomes serious. A second condition occurs when temperatures drop just below freezing during a heavy mist or light rain, forming ice films on the pavement. A third difficulty is the formation of a thick layer of ice due to wet snow and rain or rising temperature. Procedures in combating these conditions must be varied according to whether the highway has a gravel or a hard surface.

Sleet or Thin Ice on Paved Surfaces

When sleet or thin ice forms on paved surfaces, railroad crossings, road intersections, and dangerous horizontal and vertical curves should be treated with abrasives by advance trucks equipped with sand spreaders. The straight-of-ways and other remaining sections are then covered as rapidly as possible. Straight chloride salts, 500 to 700 lbs. per mile, or abrasive material containing excess quantities of either of these chemicals is used. With straight chloride salts, a narrow strip approximately 4 feet to 6 feet wide down the center of the pavement is treated. As the ice is melted and the chemicals penetrate to the pavement surface, further spread of the melting action is aided by the crown in the pavement. This first bare strip of pavement generally proves sufficient to prevent traffic accidents until temperature or the action of the chemical sufficiently loosens the ice to permit its removal with curved blades. If sleet continues or ice recurs, it may be necessary to repeat the applications.

Sleet or Thin Ice on Gravel

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on top of the ice to control skidding. If not, chloride salts are applied at a rate not to exceed 700 lbs. per mile and the surface re-scored if necessary. Generally speaking, a final blading to get rid of thin ice on gravel roads will not be found necessary.

Thick Ice or Frozen Slush

Paved surfaces are scored, if necessary, with serrate blades in order to concentrate chemicals on the road, and straight chloride salts, not to exceed 700 lbs. per mile, are applied. Abrasive materials may be applied also if required. The road surface is cleared with conventional curved blades as soon as the ice loosens. Serrate blades are used to score the surface of the ice or packed snow in order to concentrate chemicals or abrasives on the road surface. It is not intended that serrate blades will be used to peel or claw hard ice from the road surface. Attempts of this kind are futile and result in broken teeth in the blade. For this reason, serrate blades are used with light pressure, only enough to score the ice.

The procedure for gravel roads is the same as for paved surfaces, except that the final blading with conventional curved blades may sometimes be omitted.

Hard Packed Snow

Hard packed snow on paved surfaces or gravel should be treated the same as thick ice or frozen slush for the respective surfaces, if the hard packed snow cannot be removed with underbody blades or tractor graders.

While it is the general policy of the Department to maintain year-around bare road surfaces, hard packed snow can sometimes be put in safe condition for travel. Where this type of treatment is decided upon, the following procedure applies.

The snow surface should be bladed smooth with conventional curved blades to remove ruts and other irregularities. This smoothed surface should be immediately scored with serrate blades. Straight line blading during the scoring is mandatory as motor vehicles have a tendency to follow the serrations. These steps are sometimes sufficient but, if not, chemically treated abrasives are applied at a rate sufficient to control skidding.

Cost of Meter Maintenance in New Bedford

Of the 13,101 5/8" meters in use in New Bedford, Mass., in 1946, 843 were repaired and 119 cleaned and tested. The average cost of repairing was $5.56 each, and of cleaning and testing $2.84. There are 3/4" meters in use; 197 were repaired at an average cost of $6.22 and 33 cleaned and tested at an average cost of $2.32. Of the 399 1" meters, 47 were repaired and 12 cleaned and tested, the cost being $9.01 and $2.15 respectively. The cost of repairing 2" meters averaged $26.85 and of cleaning and testing $5.16.

Cannery and Distillery Waste Treatment in Maryland

At the Whiteford cannery, wastes from the freezing of vegetables have been treated by lagooning after passage through a 40-mesh screen, and the addition of sodium nitrate. Only corn and carrot wastes were treated in this manner last year, but the results were so satisfactory that additional wastes will be treated in the future. Evaporators and dryers were installed in a distillery near Westminster to care for the distillery slop, which will result in the recovery of spent grain and solubles.

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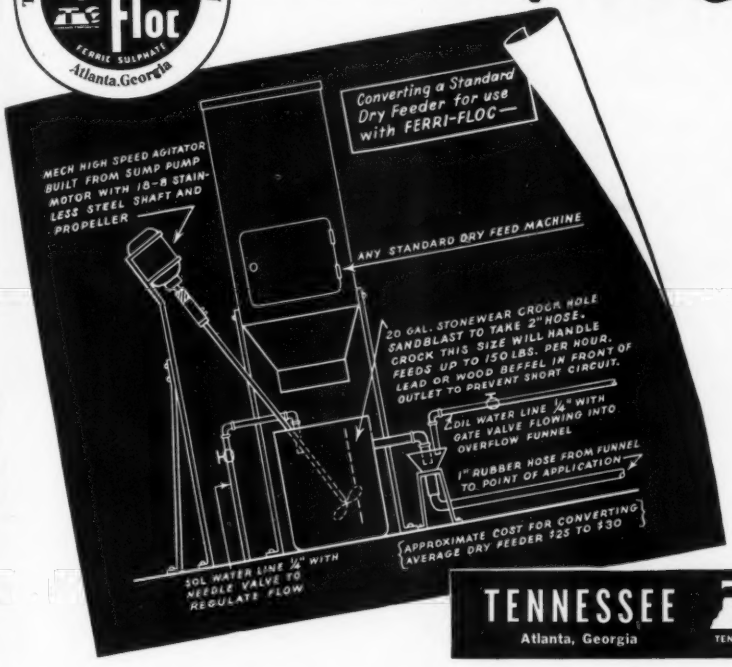
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Ferri-Floc does not pass through a gummy stage when going into solution; no appreciable heat of solution is given off, thus eliminating the necessity of exhaust fans on the solution pot. Ferri-Floc is partially hydrated and can be stored for indefinite periods of time — it may be shipped in bulk or in 100 pound bags.

We invite your inquiries for further information on the converting of your dry feeder to the use of the economical coagulant Ferri-Floc.

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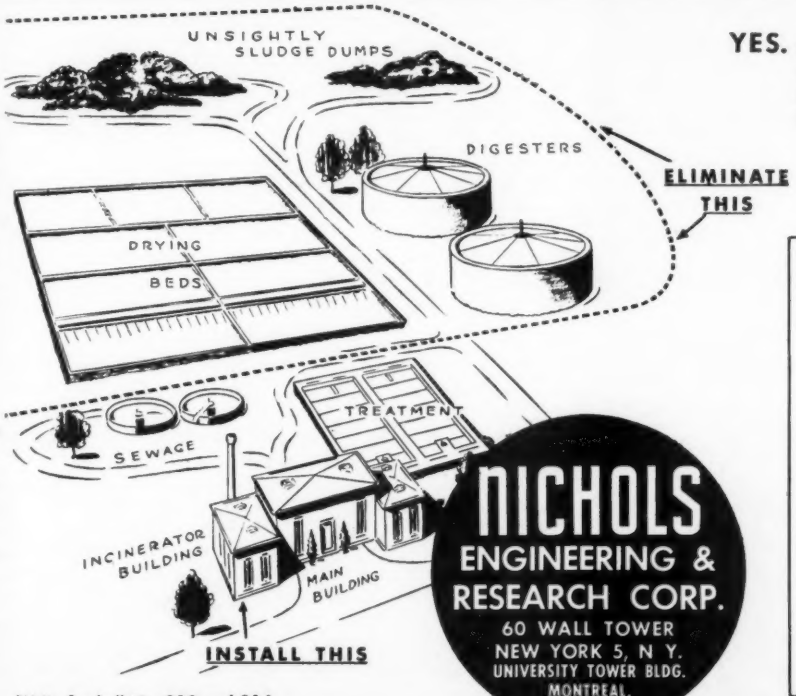
CAN THE TAIL WAG THE DOG?



YES. Sludge Incineration is the ***FINAL*** step in sewage disposal, but it should be considered ***FIRST***, because incineration simplifies the entire plant layout.

Sanitary Engineers have specified SLUDGE INCINERATION in many modern sewage treatment plants because:

1. Incineration simplifies the entire plant layout. Drying beds, unsightly, unsanitary sludge dumps and in many cases sludge digesters are eliminated.
2. Working conditions are greatly improved. Largely automatic incinerator operation replaces the unpleasant tasks connected with spading sludge off drying beds and maintaining sludge dumps.
3. Experience shows that incineration is actually cheaper than sludge hauling and dumping.
4. Positive sludge disposal is assured in all weather.
5. Incineration is the only completely sanitary method of sludge disposal.

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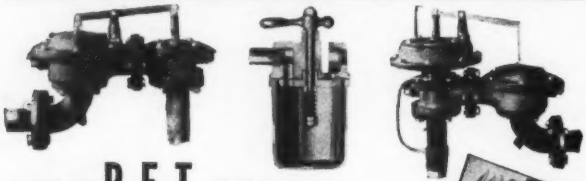

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Modern Construction Equipment for a Water Works

The New Bedford, Mass., Water Board in its latest annual report states "It is the opinion of this Board that the purchase of modern construction equipment to permit main pipe extensions by force account will, in the long run, be the most economical and satisfactory investment." Consequently, the Board has recommended the purchase of a 40 hp. crawler tractor with angle-dozer attachment, a half-yard back-hoe, a 105 cfm. portable air compressor, and additional trucks.

An Industrial Waste Guide

(Continued from page 30)

monia liquid coolers, ammonia still and absorbers. They contain cresol. Volume without cooling water amounts to 20 to 35 gals. per ton of coal processed, and with cooling water about 3,500 gals. per ton. Without the inclusion of cooling water, phenol content is 1,500 to 2,000 ppm. Population equivalent is not the most important criterion for this waste. Treatment methods include evaporation; settling to remove solids; activated carbon for the removal of phenols; and trickling filters or activated sludge.

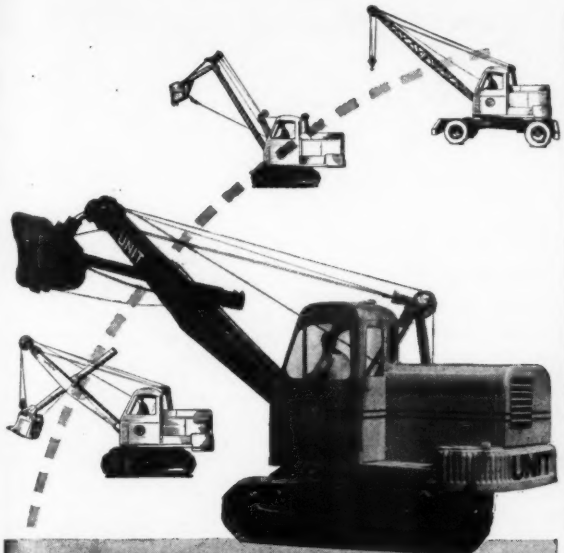
Metal and Petroleum Wasted

Metal Plant wastes contain spent coolants and cutting oils, acid or alkaline pickling solutions, metallic-cyanide solutions, and metallic salts from plating, cyanide from heat treating, and ferrous sulfate and ferrous hydroxide from pickling. Volumes and characteristics vary widely, and population equivalents are not a significant criterion. Treatment may be by lagoons, chemical cracking and oil separation, chemical treatment, evaporation, and electrolytic processes.

Petroleum wastes from oil fields contain crude oil, suspended matter and brine. Wastes from refineries contain free and emulsified oils, phenolic compounds, acids, alkalies, salts, lead and other metals, waxes, soaps and often many other components. Oil field waste may amount to 180 gals. per barrel of crude oil; and refinery waste 20 to 400 gals. per barrel of oil processed. Characteristics: BOD, 10 to 30; SS, 25 to 75; oil, under 100 ppm.; phenols, 25 to 50 ppm.; and TS (in brine) 25,000 to 250,000; PE maybe up to 60 persons per 100 barrels of oil processed. Treatment consists of evaporation, pumping the brine back into the ground, oil separation, settling, chemical treatment, and biological treatment by trickling filters, after settling and neutralization.

Personnel

The Interstate Commission on the Potomac River Basin consists of representatives from the states of the Potomac Basin and the United States, as follows: *Maryland,* Gov. William P. Lane, Jr., Senator L. H. Sothoron, and G. F. Hazelwood; *West Virginia,* G. H. Williams, Dr. N. H. Dyer, and John I. Rogers; *Pennsylvania,* Floyd Chalfant, James A. Kell and Ira T. Fiss; *Virginia,* Raymond V. Long, N. C. Bailey and J. A. K. Donovan; *District of Columbia,* Harold A. Kemp, Oliver Gasch and D. L. Seckinger; *United States,* C. C. Burger, Jr., Ralph E. Tarbett and Abel Wolman. The sanitary engineering members of the Advisory Technical Committee are: Ralph E. Fuhrman, George L. Hall, H. E. Moses, Richard Messer, J. B. Harrington, Abel Wolman and Ralph E. Tarbett.



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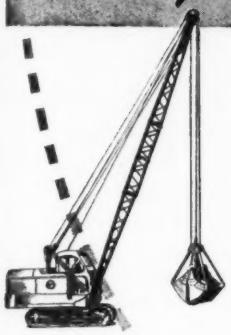

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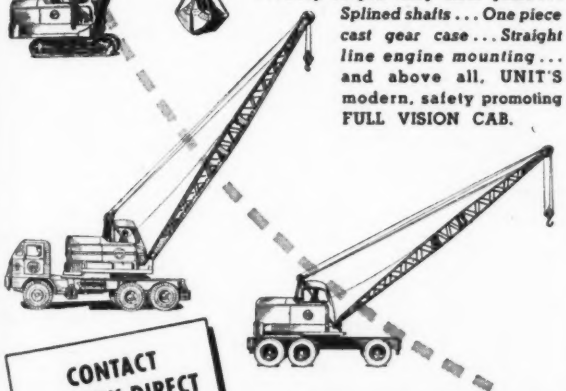

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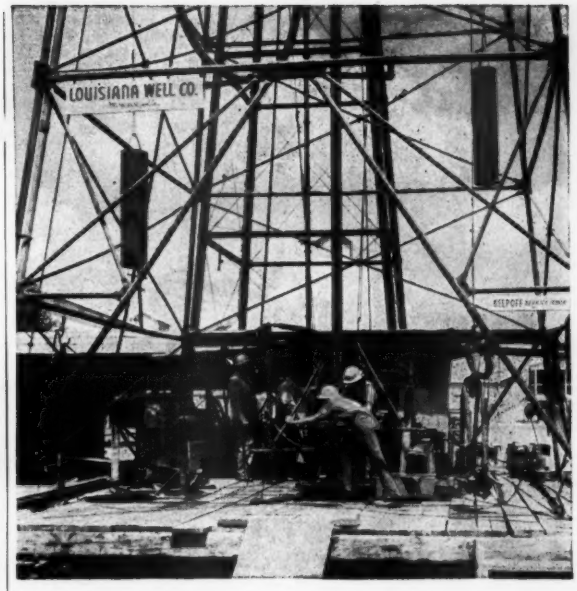

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Layne Well Water Systems are engineered and built to serve cities, factories, chemical plants, railroads, packing plants and air conditioning and irrigation projects. They have the extra ruggedness of quality and precision type of construction that gives complete satisfaction.

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PUBLIC WORKS DIGESTS

Sewerage

Water Supply

Highways and Airports

This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of the principal articles, in which the articles in each periodical are numbered consecutively throughout the year, beginning with our January issue.

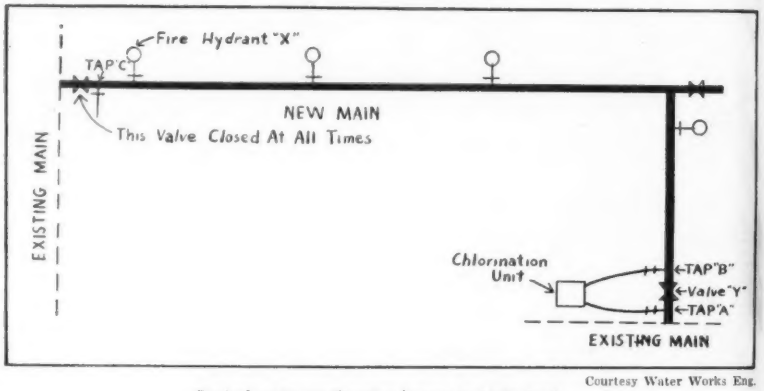
The letter and number at the end of each item refer to those used in the Bibliography. Numbers not found in the current Bibliography will be found in the one published the previous month.

The Waterworks Digest

Sizes of House Services

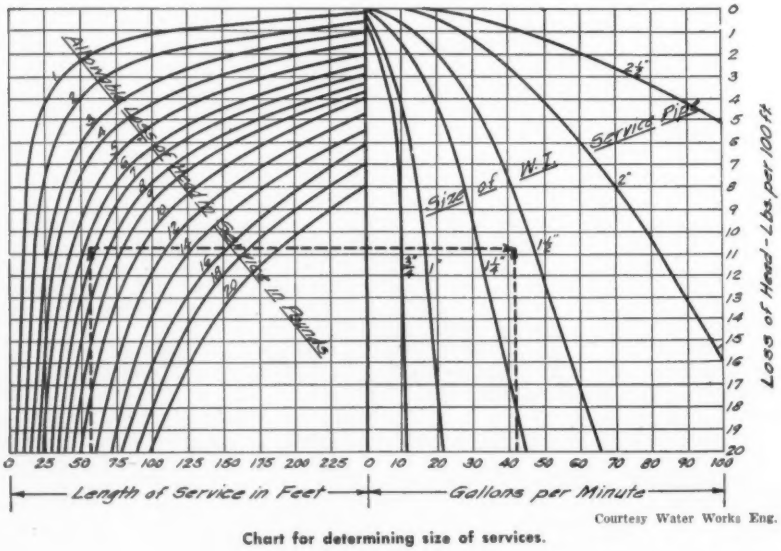
In selecting the size of service desirable for a given building, there should be considered the pressure available in the street main; the pressure desirable at the highest outlet in the building; the probable rate of use of water in the premises; the length of service pipe; the length, size, and interior condition of the house piping; the pressure loss through the meter; the nature of the service material.

The pressure available in the main minus that desirable at the highest outlet (not less than 5 psi) gives the loss permissible in the service (including the tap, gooseneck, meter and building piping) plus that due to difference in elevation of the two. Loss in the service depends upon the rate of use. A method of calculating this rate is described in the Journal of the A.W.W.A. for January, 1947. A convenient method of estimating the size of pipe required to give the desired loss (using Hazen & Williams coefficient = 100) is by use of the chart shown, or a similar one prepared for a different coefficient.[F63]



Courtesy Water Works Eng.

Typical main sterilization layout in Little Rock.


Allowable Pressure Loss - Lbs. per 100 ft.
Size of Service in Inches
Service Pipe
Size of N.P.
Length of Service in Feet
Gallons per Minute
Loss of Head - Lbs. per 100 ft.

Courtesy Water Works Eng.

Chart for determining size of services.

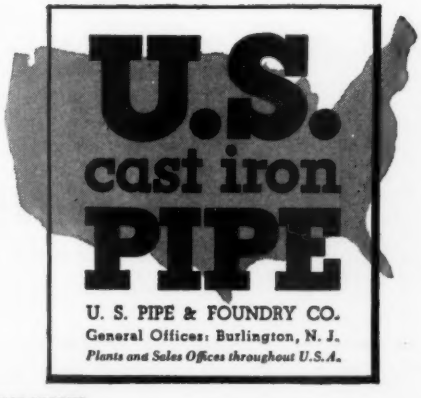
Sterilizing Mains In Little Rock, Ark.

In 1946, Little Rock laid 2½ miles of 24" main and 3½ miles of 12" to 16" mains. The portable chlorinator which had been used previously for sterilizing mains was of insufficient capacity for such large mains and could not be used against very high back pressures, and the purification plant staff constructed a trailer-mounted unit housed in a one-ton, two-wheel Army trailer. This consists of a vacuum chlorinator, two 150-pound chlorine containers, an engine-driven pump for applying chlorine against high main pressures, hose reels for holding water and chlorine hose, and storage cases which carry necessary tools, spare parts, etc. The chlorinator used in the unit is a Wallace & Tiernan Type MSVM vacuum machine, formerly used in the purification plant. The pump is a centrifugal direct connected to a 14 hp engine with a capacity of 22 gpm against a 400-ft. head. A bypass permits the chlorinator to be operated by pressure from existing mains where this is sufficiently high.

The chlorine is usually applied at

Original Woodcut by Lynd Ward

October is the month when many farmers can take a deep breath and relax a bit. Not so in a pipe foundry. We must continue month after month to maintain our rigid quality controls from raw materials to the final test on the finished products. These products, cast iron pipe and fittings, are being constantly produced and shipped to all parts of the country by our plants to meet the urgent needs for water, gas and sewerage service.



one end of the main, during which time a stream of water is allowed to flow through the main to act as a carrier for the chlorine. This water is discharged at the other end of the main either through a fire hydrant or through corporation stops installed for this purpose. The presence of chlorine, in sufficient amounts, in the water flowing out of the hydrant or taps indicates that the chlorine has passed through the entire length of the pipe. At this point, the application of chlorine is stopped, all taps, valves and hydrants are closed, and the chlorine solution allowed to remain in the pipe line for twenty-four hours.

Bacteriological tests are then made of samples collected from each end of the line treated and from intermediate points not more than three blocks apart. Samples are taken through corporation stops and never from fire hydrants, which may contain organisms that may have entered through the drain valve.[F66]

Automatic Residual Chlorine Analyzer

An automatic recording analyzer for continually measuring the residual chlorine content of water, built and satisfactorily operated for 12 months at the Belle plant of E. I. du Pont de Nemours & Co., is described. It is based on the principle of measuring photoelectrically the intensity of yellow color produced by the reaction of chlorine and ortho-tolidine in acid solution. An important feature of the analyzer is the use of two solution cells and a null-point potentiometer circuit which compensate for color or turbidity changes in the water and for light variations due to changes in light voltage. A range of 0-0.5 ppm of residual chlorine was selected for the prevailing conditions, but may be changed as desired by substitution of resistors in the circuit. Accuracy and sensitivity of the analyzer were found to be about ± 1 per cent of the recorder scale for the present range.[A98]

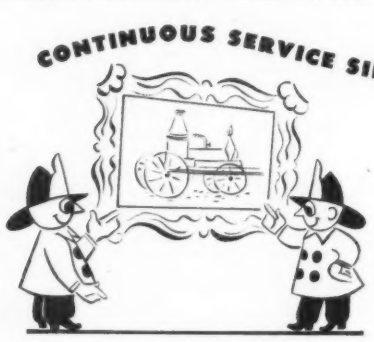
Triple Sedimentation At Norristown, Pa.

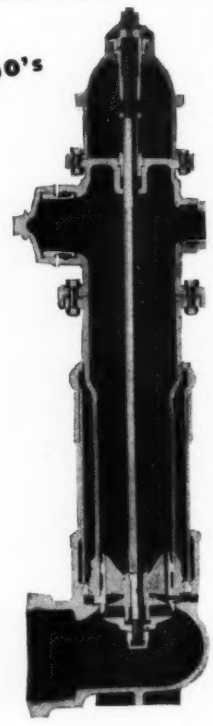
Norristown takes its supply from the Schuylkill river, which carries culm from the coal regions, the turbidity running at times up to 25,000 ppm, but during dry weather may drop to 25 ppm. It was settled in 2 primary and 2 secondary tanks, the former having a water depth of 2 ft. and a detention period of 16 min., the latter a depth of 10.7 ft. and 2.7 hr. detention period. The heavy solids accumulated rapidly in the primary tanks and were carried over to the secondary. They were removed from the primary tanks by hand scraping, and from the secondary by flushing; the latter requiring temporary shutting down of half the settling capacity. To eliminate these difficulties there has been installed a third clarifier ahead of the other two. This is 110 ft. in diameter with a side depth of 10 ft. giving a detention period of 85 min. Entirely surrounding the tank is an effluent channel placed 2.5 ft. inside the wall, both edges of which serve as overflow weirs. Sludge is moved to the center by scrapers rotated by an extra-heavy industrial type drive, provided with a device which automatically raises the scrapers when the sludge becomes so thick as to threaten stalling the mechanism. Should it stall in spite of this, the motor is shut off and an alarm sounded.

The original primary tank is 130 by 150 ft., and wood plank around-the-end baffles have been installed which provide a longer passage and eliminate short-circuiting.[E22]

Reducing Underground Leakage in Chicago

During the 15 yr. from 1932 to 1947 Chicago Dept. of Public Works located and stopped 272 mgd of underground leakage in its 3,914 miles of water mains. The 1946 rate of pumpage was 90 mgd less than the rate for 1930, although the metered consumption was 130 mgd greater. During that period the head at the pumping station decreased from 125 ft. to 122 ft. but the average delivery pressure increased from 35 psi to 38 psi. Power costs for pumping and repair and rehabilitation costs have decreased; the life of pumps, boilers and motors has increased, and much plant construction





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Take the valve assembly, for example. The drain valve, positive and automatic, is an integral part of the guide and the upper main-valve plate. Keyed to the hydrant stem, it moves vertically with the main valve. As the main valve opens, the drain valve closes the orifice, and vice versa. The main valve, true compression type, opens *against*, and closes *with*, the pressure; there is no strain, no leakage—even if the hydrant should be broken in traffic. The assembly being cone-shaped, the water can be turned on or off gradually—no water hammer, minimum friction, minimum deposit of sediment on the valve seat.

Mathews have long been the leading hydrant the world over. Insist that your community have the extra protection of this famous make.

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MATHEWS HYDRANTS

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Manufacturers of "Sand-Spun" Pipe (Centrifugally Cast in Sand Molds) and R. D. Wood Gate Valves

When you need special information—consult the **ENGINEERS' LIBRARY** *on pages 69-73*

has been postponed. To accomplish this, 12 field crews have been organized and trained to locate and stop underground leakage, at a cost of $390,000 a year.[A99]

Inspecting Materials and Equipment

Chicago, Ill., spends $7,000,000 annually for operating its water works system and $5,000,000 more for maintenance and expansion. All purchases amounting to $500 or more must be made on contract and under specifications, which are written so as to obtain the widest selection consistent with utility, quality and price. In preparing specifications, the bureau leans heavily on the AWWA specifications for pipe and specials, valves and coatings, and on certain specifications of the federal government and the Society of Automotive Engineers, but chiefly those of the A.S.T.M.; but these are enlarged or qualified to fit local needs. The specifications are enforced by the Testing and Inspection Dept. Inspection and testing give the purchaser close control of quality and workmanship; the presence of his representative at the source of supply often expedites delivery of materials; and the cost is very reasonable—the average for Chicago is 2% of the value of the materials. The contractor benefits by knowing, when bidding, that all bidders must furnish substantially identical products; his workmen are more alert and careful; and the inspector's experience often enables him to suggest methods of quick and efficient production.

As the average rejection of castings in the foundry is slightly over 20% and rejection of lumber and timber averages 14%, etc., it is apparent that the saving resulting from rejections greatly exceeds the cost of inspection.[A100]

Reclaiming Old Cast-Iron Pipe

Atlanta, Ga., water department has been salvaging old cast-iron pipe for eight years. This year it is salvaging 18,000 ft. of highly tuberculated 8" pipe formerly used by a defunct industrial plant. Rust and dirt are scraped off the outside. The interior is cleaned by means of an auger, the end of which carries 6 chains as hammers revolved at 1500 to 2,000 rpm; directly behind which is a circular wire brush, with 2 additional ones farther back. The pipe is then lined with cement mortar, using a spinning machine made by employees of the department. Great care is employed in preparing the mortar. White silica sand is used, thoroughly dried to insure getting the proper water content to give a 9" slump; the mixture being 462 lb. of sand, 294 lb. for portland cement, 91 lb. of slag cement (natural) and 152 lb. of water. This is applied uniformly in the pipe, which is rotated for about 5 min. at 800 rpm, giving a lining about 1/8" thick with a mirror-like finish. Finally about a quart of asphalt emulsion paint is spun

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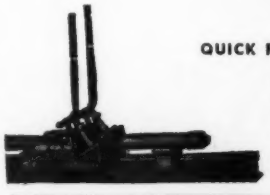

QUICK FACTS ABOUT THE GREENLEE HYDRAULIC PIPE PUSHER

Easy — one or two men can easily operate on any job. *Portable* — compact, easy to carry to job and set up. *Fast* — operates at six different speeds. *Two models* — (1) for pipe up to 4-inch; (2) for larger pipe, drainage ducts, concrete sewer pipe. Do the job easier, quicker with a GREENLEE.

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on for about 2 min. A crew consisting of a foreman, 6 laborers and the operator of the spinning machine can clean and line 20 sections of 8″ pipe in one day. The cost, including painting the outside with bituminous enamel, has averaged about 25¢ per lin. ft.[E25]

Radio Communication

Radiocommunication systems used by water utilities promise great savings in time (resulting in large savings in money and property during emergencies), mileage on repair trucks, telephone calls, etc., to say nothing of the general good will to be obtained from the customer by such prompt action. They can be used for keeping track of maintenance crews; direct communication between maintenance crews on the job and the maintenance engineer in his office; installation in night service man's truck makes customer "turnons," "cutoffs" and first hand investigation of emergencies more feasible. In case of floods, earthquakes, hurricanes, etc., radio provides a reliable means of communication when all normal means of communication are disrupted. In all cases, it provides the customer with speedy action on complaints. Another practical use of radio by water utilities is hydrological telemetering such as stream gauging, determining the water level in reservoirs, and other similar uses. The FCC has acknowledged the possibilities of using radio for telemetering purposes and has allocated frequency channels above 940 Mc for uses of this nature.

All radio transmitters are required to be licensed by the Federal Communications Commission, and certain operating personnel are required to be licensed. In May 1945 the FCC allocated certain frequency channels to electric, gas, water and steam utilities.

Mobile radio systems may be installed to furnish 2-way communications, 1-way communications, or signalling. A 2-way system may be used as a one-frequency system or a two-frequency system. The minimum equipment required for a two-way system is: (1) A transmitter and receiver located at the water works plant, commonly called a *land station;* (2) a transmitter and receiver installed in the maintenance truck, or other vehicle, commonly called a mobile unit.

Water utilities planning a radiocommunication system should write the FCC in Washington, D. C., requesting information as to how to obtain the necessary licenses.[F65]

Cleaning Porous Concrete Wells

Porous concrete water wells have been used by the Shell Oil Co. since 1921. The porous sections are made with a mixture of cement and gravel and have a porosity of about 30%; the non-porous sections are a waterproof sand-gravel-cement mixture. The typical well contains 60 ft. of porous pipes 30″ inside diameter and 5″ thick, guaranteed to pass 10 gpm per sq. ft. of outside surface. Like metal screens, they clog in time, but can not be treated with acid, and "Calgon" is used. This gives an average drawdown improvement of nearly 3 ft. at each annual treatment, apparently due largely to the dispensing of iron and sequestering of calcium carbonate. When suitable slimicides are added to the solution, both inorganic incrustations and gelatinous masses of slime appear to be removed effectively. The chemicals are added daily for a week or ten days and meantime the well surged several times daily.[A101]

Bibliography of Waterworks Literature

D *The Surveyor (England)*
August 8

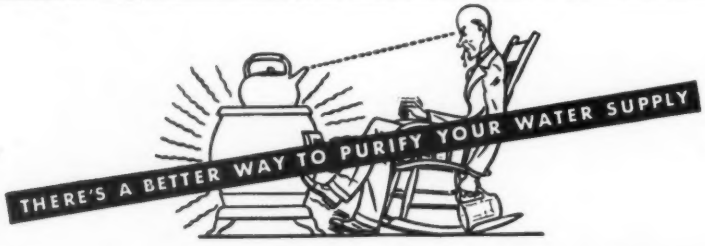
4. Progress in Northern Ireland on Water Schemes. By R. E. D. Bain. Pp. 407-408.

E *Engineering News-Record*
September 4

24. Waterworks Showplace in South Africa. Pp. 80-82.
25. Cleaning and Lining Cast-Iron Pipe With Shop-Built Equipment. Pp. 93-95.

F *Water Works Engineering*
August 20

66. Main Sterilization Practices at Little Rock, Ark. By W. A. Mayhan. Pp. 1002-1003, 1022.
67. Denver Water Plan Improvement Program Calls for $30,000,000. Pp. 1015, 1024.
68. Selecting House Service Sizes. By Angus D. Henderson. Pp. 1016-1017.



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G *Water and Sewage Works*
August

33. Fluoride Removal. By Robert Wamsley and W. E. Jones. Pp. 272-276.
34. Operation of Small Filtration Plants. By A. E. Clark. Pp. 277-278.
35. Water and Sewage Works Needs of the United States. Pp. 294-297.

P *Public Works*
September

26. Practical Water Works Operation Data from Detroit. Pp. 24-25, 30.
27. Results of Chlorination of Army Water Supplies. By Charles C. Spencer. Pp. 31-32.
28. An Outline for an On-the-Job Training Program for Water Department Personnel. Pp. 38, 40, 42, 44.

S *Construction Methods*
August

2. Dam Face Grouted Against Hydrostatic Pressure. Pp. 90-92.

X *Southwest Waterworks Journal*
August

29. How Dallas Met a Water Shortage. By K. F. Hoefle. Pp. 11-14.
30. Meter Reading and Billing. By E. F. Price. Pp. 18-22.

WATER WORKS PUBLICATIONS

Water Analysis.—A 100-page bulletin on the analysis of municipal and industrial waters is available on request from Solvay Sales Corp., 40 Rector St., New York. This excellent booklet also gives information on reagents, indicators and standard solutions, conversion tables and atomic weights.

Transite House Connection Pipe.—This is an 8-page folder showing how this type of pipe is used in sewage disposal lines from houses to street sewers or septic tanks. Ask for TR-58A, Johns-Manville, Box 290, New York.

Lining Water Mains in Place.—A 28-page booklet on how to apply cement mortar linings to water mains to prevent corrosion, maintain capacity, stop leakage and attain other advantages. This is a mechanical method for mains 24" and larger, without removing the mains from the ground. The process is described and results given, with "C" before and after lining. Contains much valuable data; and specifications. Write Centriline Corp., 140 Cedar St., New York.

Hot Process Water Conditioning.—A new 12-page bulletin describing the equipment used and explaining what it is supposed to do. Ask for 28B6611. Allis-Chalmers Mfg. Co., Milwaukee 1, Wisc.

Pressure and Level Controls.—Here is a 100-page catalog that describes the uses of modern control equipment. There are 5 sections, covering diaphragm valves, liquid level controls, strainers, pressure reducing and regulating valves, pump governors and steam plant equipment. This catalog, No. 47, is designed as a working tool for engineers. It will be sent on request to Kieley & Mueller, Inc., North Bergen, N. J.

Chlorine Manual. — This 32-page publication of the Chlorine Institute, New York, N. Y., is of value to anyone using chlorine. The first section presents facts about chlorine, its properties and physiological effects, and describes the usual containers. The second section gives sound advice on handling chlorine, whether in cylinders, ton containers, tanks cars or barges. The third section covers the important subject of employee protection and includes emergency measures, prophylactic measures and first aid. The final section considers the chemical characteristics and physical properties and contains a complete literature reference section.

Water Well Handbook

The Missouri Water Well Drillers Association is publishing a "Water Well Handbook" containing nearly 200 pages of charts, tables, and other data pertinent to the drilling, testing, and operation of water wells. The book has been compiled and edited by Keith E. Anderson, Geologist and Engineer, Missouri Geological Survey and Water Resources. Chapter headings are: Mathematical formulas and conversion tables; Water data; Cable tool drilling; Rotary drilling; Pipe and casing; Pumps; Electrical data; Flow measurement; Quality of water; Hydrology and geology of wells; and Miscellaneous data. The handbook is pocket size with a flexible cover. For copies write to the Missouri Water Well Drillers Association, Box 250, Rolla, Missouri. Cost will be about $1.50.

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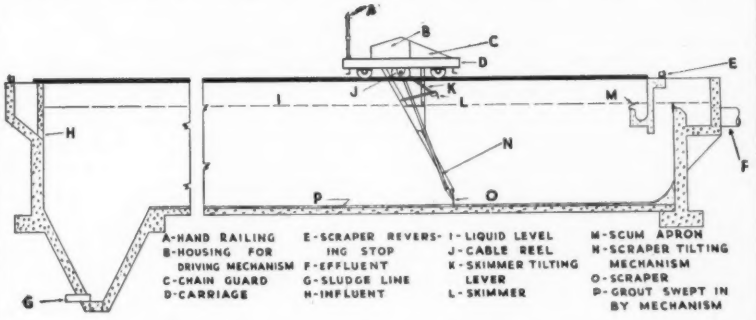
HARDINGE RECTANGULAR CLARIFIERS



In sewage or water treatment plants where space is limited, or where sludge delivery is desired at one end of the tank—the Hardinge Rectangular Clarifier provides a compact, efficient unit.

A traveling bridge crane spans the tank and supports a sludge scraper. This mechanism moves automatically along the tank, scraping all settled solids into sludge hoppers at one end.

Write for Bulletin 31-D which describes the complete line of Hardinge Clarifiers, Thickeners, and Agitators

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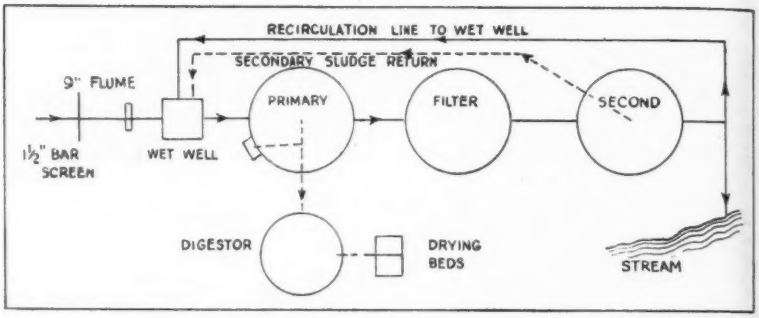
The Sewerage Digest

Biofiltration At an Air Base

At the Columbia, S. C., Army air base the treatment plant consists of a bar screen, pumps lifting the sewage 21 ft. from a wet well to a primary clarifier, high-rate trickling filter, secondary clarifier, and a floating-cover digester. The final effluent was circulated back to the wet well at varying rates which maintained a constant level in the wet well. Both clarifiers had a detention period of 1¾ hr. The digester had a capacity of 3.8 cu. ft. per capita. The filter was 7.6 ft. deep, receiving an average of 2.8 lb. of BOD per cu. yd., which reached 3.6 lb. for extended periods with no detrimental results, and dosages reached 35 mgad. The sewage averaged 0.16 lb. of BOD per capita and 0.15 lb. of suspended solids. There was very little sewage flow from midnight to 6 A.M. The plant removed 76.5 to 84.6% of BOD and 79.0 to 82.8% of suspended solids.

A peculiar feature was that the water in the primary tank was higher than that in the digester and some of it siphoned into the digester; as a result of which, sludge from the clarifiers was of low solids concentration, and the amount of supernatant returned to the wet well was excessive. For this reason, the supernatant was returned after midnight, when it was diluted with the final effluent at a rate as high as 5:1. Also the secondary sludge was returned at a continuous low rate, by gravity, to the wet well and settled readily in the primary clarifier.

The filter acts as a decolloider, coagulating the colloidal material, reduces the BOD and builds up the dissolved oxygen. It unloads continually, removing large numbers of Psychoda fly larvae before they develop into adult flies. Low pH values of 6.6 did not seem to affect adversely the operation of the digester. Total acidity seems to be a better indication of digester activities and the advantage of using lime is questionable.[G27]



Courtesy Water & Sewage Works

Flow diagram, Columbia Army Air Base.

Flies and Odors at Plants

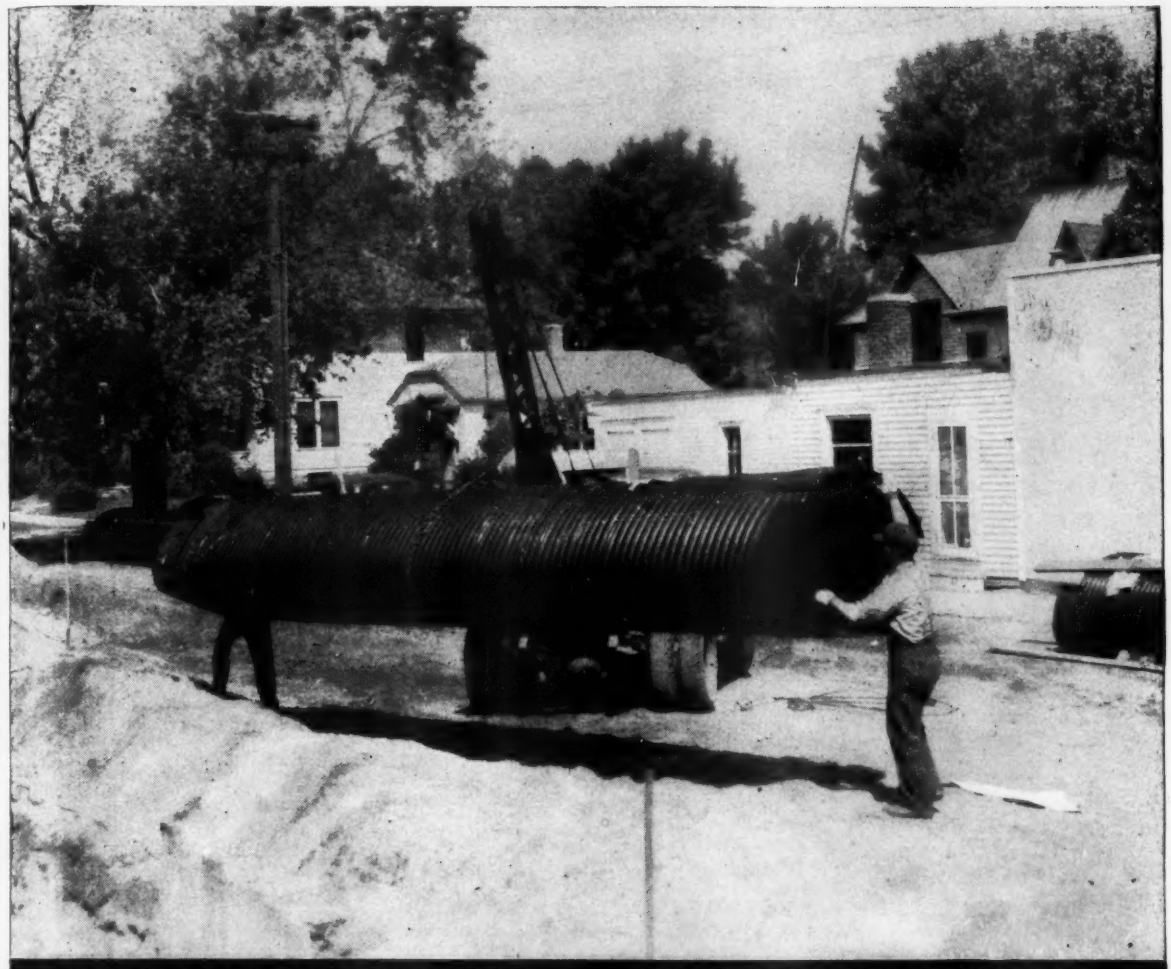
Operators of filter plants in England find flies a great nuisance. They get in the noses and ears of the operators, and in summer painting around the plant is a waste of time for the flies are attracted by the paint and practically cover the entire freshly painted surface. DDT seems to be an effective remedy, and its toxicity to fish can be minimized by treating only one filter at a time. As to odors, the author finds that most of those noticeable at a plant are in the raw sewage and are not created in the plant. Two hours' flow in a main used as a test caused more odor from the sewage than 48 hr. of standing in the laboratory, probably due to the existence of very active anaerobic organisms in the slime in the main. Odors may be caused by petrufaction in the sedimentation tanks but can be prevented by use of mechanical desludging devices (universal here but not in England). Filters usually give off a somewhat unpleasant odor at times, and if the tank effluent which is distributed is over-ripe the odors may be considerable. There may be considerable odor from drying beds receiving undigested sludge but should be little if the sludge is from digesters.[H15]

Zinc Metallizing To Prevent Corrosion

It was necessary some time ago to empty a sludge digestion tank at Marshalltown, Ia., when it was found that corrosion of some metal parts in the interior made some corrective measures necessary. The wrought iron pipe heating coils were covered with 1/16 in. of hard scale, which was removed; there was little evidence of corrosion. But the steel floating cover, steel gas piping and structural steel pipe supports were severely corroded and pitted in places. On the cover, corrosion was most severe in the gas dome and central area, along the plate welds and on the outer rim plate. The cast iron pipe was not corroded. The wood roof sheeting was badly decayed and disintegrated, probably due to the high temperature and humidity under the roof.

To prevent continuation of the corrosion, the corroded parts were removed and metallized with zinc; as were also 24 of the aeration tank swing diffusers, outlet weirs and weir-supporting angles. Previous to metallizing, the parts were sand-blasted and immediately covered with zinc before either grease or oxide film could collect on the surface. An attempt was made to give a zinc coating between 0.012 and 0.015 in. thick, which was recommended to give a life of 15 yr. The cost, including all expense

Murals on the Westport mill of the Dorr Co.



Where headroom is limited—where you have to "duck" under an intersection or railroad, for example—ARMCO Pipe-Arches offer an ideal solution. Like other types of ARMCO Asbestos-Bonded Sewer Pipe, these arches are strong, light in weight, easy to handle, and assure years of low-cost trouble-free service.

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Installing ARMCO Asbestos-Bonded Sewer Pipe is easy . . . simple . . . fast. The long, light-weight pipe sections are lowered into place and securely coupled in jig-time. No curing and speed is the word — the kind that saves money, work, valuable days.

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An experienced Armco Engineer will gladly give you full information — sizes, prices, delivery data — on ARMCO Asbestos-Bonded Sewer Pipe. Write our nearest office for full data. Armco Drainage & Metal Products, Inc., 735 Curtis Street, Middletown, Ohio.

ARMCO

Armco Asbestos-Bonded Sewer Pipe

other than labor and equipment, was 42¢ per sq. ft. of surface metallized; but this can probably be reduced to 25 to 30¢ by making quantity purchases of sand, zinc and oxygen.[H40]

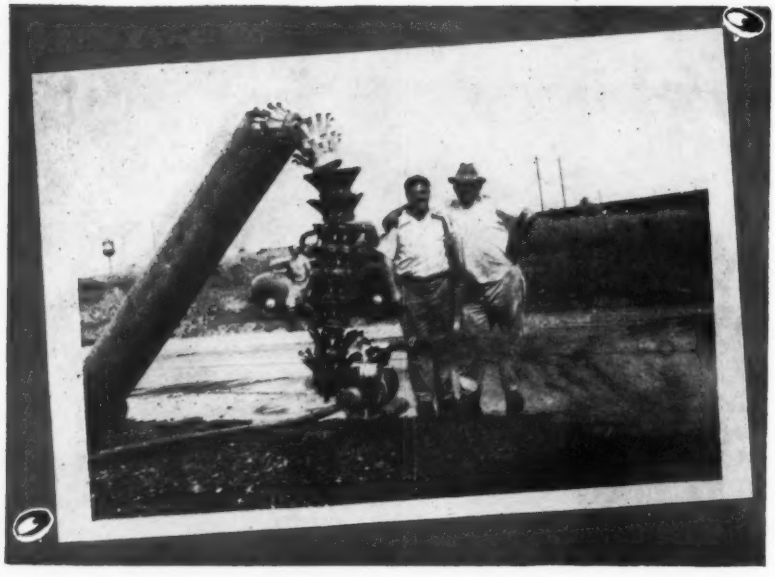
Explosion Hazards in Manholes

Presence of combustible gases in sewers may be due to flat grades, siphons, turbulence at junctions, too long intervals between manholes, absence of ventilation through house vents; stoppages in the sewers, slime growths, discharge into the sewers of inflammable liquids or solids; leakage into the sewer from gas service mains, gasoline, fuel oil or ammonia pipes; sewers flowing full so that there is no room in them for ventilation.

To eliminate these hazards, the city of Los Angeles has adopted the following protective measures:

1. A systematic and continuous program of explosive gas inspection in all manhole structures, pumping plants and disposal plants, for detecting the presence of explosive gas in order that proper steps may be taken to remedy the condition. 2. A preventive program of maintenance and operation for the inspection, cleaning and maintaining of sewers and storm drains. 3. Elimination of all flat grades in sewer lines causing settling out or retarding of flow. Natural ventilation of all sewer lines, and special natural ventilation for overtaxed sewers, and where sewer traps or siphon structures exist. This is standard practice procedure in design. 4. Special ventilation when necessary on large outfall sewers that have improper natural ventilation. 5. The chemical treatment of sewers and storm drain lines for the reduction of septic conditions and the elimination of slime growth. 6. A planned industrial waste program for the inspection of all industries, particular attention being paid to service stations, wash racks, garages, machine shops, chemical manufacturing companies, packing houses, gasoline plants, railroads, and dyeing and cleaning establishments. Prompt action for repair and elimination of conditions where natural gas, coal gas and petroleum enter the sewer lines. The removal within manhole structures of all pipe lines and conduits now located in brick work, and where pipe lines are located so close to sewer storm drain lines that the corrosive conditions result.[H41]

another "SNAP"



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Actual snap-shot shows 12" "Flexible" pressure line scraper at the end of its run. Sizes of pipe cleaned included 6", 8", 12", 16" and 20" lines.

Another "snap" for the Album of "Flexible" Tools and Experience shows this run in the 12" water main on Jersey Avenue, New Brunswick, N. J. Work was carried through to completion in fast time, at low cost and with a minimum of inconvenience to water users. As in most "Flexible" operations, this New Brunswick job was taken on a 100 per cent contract basis. Depending, however, upon customer option, "Flexible" also contracts tools and supervision, rents tools, or makes outright tool sales for all line cleaning requirements.

Your pipe cleaning needs are important. It will pay you to check "Flexible" today on any basis—equipment, methods, cost.

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Treating Strong Wastes

For treating strong milk, vegetable and meat processing wastes, the authors propose the use of a self-cleaning fine screen, 10 meshes per inch; a high-rate filter using tile medium containing vertical 1-in. round holes; a conventional settling tank; and, to produce effluents consistently below 50 ppm, a second stage of similar filters. These wastes are not well suited to digestion, and a sludge storage tank and vacuum filtration are recommended for the larger communities, and direct chemical dewatering on sand beds for the smaller ones.[P26]

Profits From Sewage Farming

In Johannesburg, South Africa, sludge is dried in wet weather but not in dry weather. In dry weather the digested sludge is discharged into the purified effluent, which is used for irrigating farm land operated by the city. Here they raise Indian corn, potatoes and other crops that are not eaten without cooking, rotating with clover or other grass; 3,000 head of cattle graze on the farm, for which farmers pay 8 cts. per head per day. They also fatten cattle for the market and breed sheep. The considerable profit from this farming—approximately $50,000 a year—is used for research work in sewage disposal and in educating poor boys and girls at the university.[D29 & 31]

Treating Toxic Metal Wastes

The wastes of Talon, Inc., at Meadville, Pa., contain spent acids, largely sulfuric; heavy metals—copper, nickel, chromium, zinc and aluminum; cyanides; and soap, oil and grease. In 1941 a plant was built to treat 20,000 gpd of these wastes, the essential elements of which were a contact chamber where the

raw acid wastes were introduced for reduction of chromates, a neutralizing chamber where milk of lime was introduced and the mix flocculated, and a settling basin with sludge removal equipment. The wastes have increased in amount to 87,000 gpd, and a new plant is being built of 100,000 gpd capacity, which will consist of facilities for treatment of spent pickling liquor, nickel plating wastes and mill room wastes combined, by means of ferrous sulfate and lime; and facilities for treatment of the cyanides wastes by chlorination, with additional provision for removal of copper (small quantities of which occur in these wastes). Mixing mill room wastes and acid wastes saves in lime for neutralizing the acids and aids in separating soap and oil from the mill room wastes. Treating the cyanides wastes separately with chlorine rather than iron-lime treatment reduces the amount of sludge.[G27]

Bibliography of Sewerage Literature

D *The Surveyor (England)*

August 8

29. Sewage Disposal Practice in South Africa. By E. J. Hamlin. Pp. 413-414.

August 15

30. The Flume-Controlled Detritus Channel. By L. B. Escritt. Pp. 423-424.
31. Sewage Disposal Practice in South Africa. Discussion of D 29. Pp. 429-431.

E *Engineering News-Record*

August 21

14. Report on China's Sanitation Progress. Pp. 94-95.

September 4

15. Pumping Can Be Simplified for Small Sewage Disposal Plants. By William J. Wenzel. Pp. 109-110.
16. Sludge Depth Indicator. By James H. Blodgett. P. 110.

G *Water and Sewage Works*

August

24. Treatment Works for Plating Wastes Containing Toxic Metals and Cyanides. By George E. Barnes. Pp. 267-271.
25. Graphic Heat Loss Computation for Sludge Digesters. By John G. Montgomery. Pp. 287-291.
26. Tables for Computing Heat Losses From Digesters. By Henry B. Candee. Pp. 292-293.
27. Biofiltration Experiences at Columbia, S. C., Army Air Base. By James M. Brown. Pp. 301-303.

H *Sewage Works Engineering*

September

39. Flow Coefficient Tests on Transite Outfall. By A. J. Maahs. Pp.473-475.
40. Electrolysis and Corrosion Corrected by Zinc Metallizing. By T. R. Lovell. Pp. 476-477.
41. Explosion Hazards in Manholes: Causes and Protective Measures. By Reuben F. Brown. P. 478.
42. Maintenance of Mechanical Sludge Collectors. Pp. 483-484, 490.

I *Municipal Engineering (England)*

August 15

15. Flies and Odors at Sewage Plants. Pp. 80-81.

August 22

16. Transportation of Refuse by Barge. By Charles Boden. Pp. 92-95.
17. Sewage Disposal Practice in South Africa. By E. J. Hamlin. Pp. 95-96.

August 29

18. Screening and Grit Removal in Sewage Disposal. By J. Moore. Pp. 107-110.

L *Civil Engineering*

September

7. Stream Pollution Abatement Standards Require Economic Justification. By R. B. Wiley and W. E. Howland. Pp. 37-41, 76.

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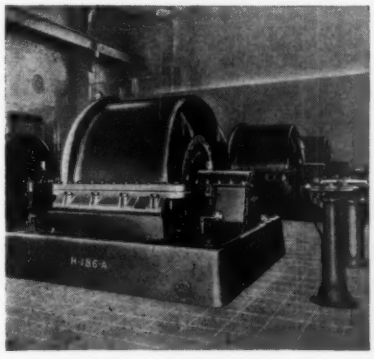

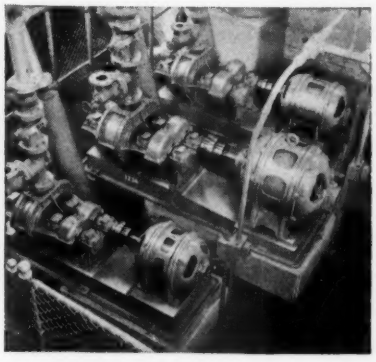

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So — for new plants, expansion or replacement, consult R-C *dual-ability*. Send for our new free bulletin No. 23-120-B10 showing many blower applications. It will prove that you can enjoy the long years of satisfaction resulting from our blend of advanced engineering and a half century of blower-building experience.

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P *Public Works*
September

25. Sewer Rental Data. Pp. 19-20, 32.
26. The Treatment of Strong Wastes. By A. W. Banister and R. J. Ellison. Pp. 26-27, 30.
27. How to Design Imhoff Tanks and Trickling Filters for Schools, Camps and Hotels. Pp. 33-34.
28. How to Inspect Sewers and Drains During Construction. P. 44.

Y *Contractors Record (England)*
August 20

4. Rate of Flow and Strength of Sewage. By L. B. Escritt. Pp. 15-17, 39.

SEWERAGE PUBLICATIONS

The Meat Packing Plant Waste Disposal Problem.—By E. F. Eldridge, Michigan Engineering Experiment Station, East Lansing, Mich. Bulletin No. 105. This is a 50-page booklet, consisting of articles reprinted from the *National Provisioner*. These consider the method of treatment as affected by local conditions; the small plant treatment problem by means of septic tanks and sometimes trickling filters; primary treatment for the larger plant, including sludge digestion; and secondary processes, including low-rate and high-rate filters and activated sludge. There is a good bibliography.

Sewer Cleaning.—A 36-page booklet lists and describes many items of equipment for sewer and pipe cleaning and gives full working instructions. Flexible Sewer-Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

Sewer Inspection Details.—Instructions for inspection of sewers and drains during construction. Practical data on what to do and how to do it. Clay Sewer Pipe Ass'n., Columbus 15, O., attention Benjamin Eisner.

Small Scale Biofiltration.—Dorr Co. 570 Lexington Ave., New York, has just published a bulletin which describes briefly the duo-clarifier and the duo-filter. The combination of these make biofiltration possible with only two structures.

Controlling Filter Flies.—Control of Filter Flies by Application of DDT Emulsion to Trickling Filters is an interesting publication now available from Proportioneers, Inc., 96 Codding St., Providence, R. I.

Shallow Pond Sewage Treatment to Be Studied

The effectiveness of shallow ponds or lagoons for the treatment of cannery wastes is to be the subject of a study by the California Bureau of Sanitary Engineering. Rates of evaporation, rates of sewage and the advantages of recirculation of oxidized effluent will be among the points to be checked and evaluated. Results of the study will be valuable in a consideration of industrial waste problems of this nature which are continually arising throughout California, particularly in the Sacramento and San Joaquin Valleys.

The China Sanitary Engineering Service, Inc.

The China Sanitary Engineering Service, Inc., has been formed to (1) promote, design, construct and supervise the operation of water works and other sanitary facilities in China; (2) represent standard American manufacturers of equipment and to build up an efficient sales and service organization; and (3) utilize the proceeds from these services to support research and educational programs in sanitary engineering and public health. The China office is in Room 33, 110 Szechuen Road, Shanghai, China; the organizing office is at 364 Lebanon St., Melrose, Mass. It is the intention to construct more adequate facilities in China, consisting of an Administration and Engineering Building, a Research and Testing Laboratory, and Shops and Warehouse facilities.

Among the leaders in this worthy project are D. S. Abell, now chief sanitary engineer of the UNRRA mission to China; John R. Snell, who is now organizing the work from the Melrose office, Wah-Choy Ching, Roy Welter, Avard Ostrom, Lenier Young, S. F. Wang and T. Y. Koo.

The great success of the Institute of Inter-American Affairs in cementing friendly relations with our South American neighbors through sanitation and sanitary engineering is an indication of how important an hitherto unthough of

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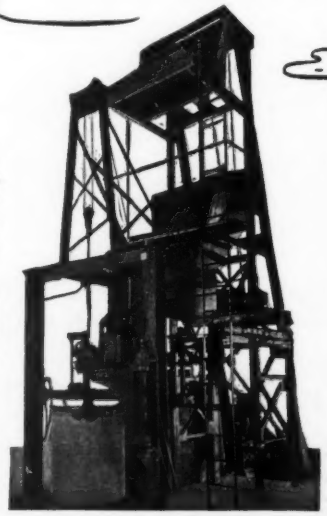

This is a UNIVERSAL Concrete Pipe Machine - - efficient producer of fine UNIVERSAL Concrete Pipe.

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effort can be in international affairs. The China Sanitary Engineering Service offers great promise. In addition to the interests of American manufacturers, it will be dependent, certainly for some time to come, in the financial cooperation of individuals and foundations. Full information can be obtained from John R. Snell, 364 Lebanon St., Melrose, Mass.

National Supply Co. Personnel Training

The National Supply Co. has inaugurated a personnel training program for all of its manufacturing, sales and engineering units. Dr. B. E. Warden, former dean of students and director of student personnel at Carnegie Institute of Technology, has been appointed educational director, with headquarters at Pittsburgh. The training program will include not only supervisory personnel but also employees working upward to positions of responsibility.

Movies on Hookworm, Insects and Sanitation

The Institute of Inter-American Affairs has produced a number of 16 mm. color films with sound in English, Spanish and Portuguese. These are of the animated type produced by Walt Disney. "Insects as Carriers of Disease," 10 minutes, demonstrate the louse, the mosquito and the fly. "Hookworm," 11 minutes, shows how infection occurs and how to prevent hookworm. "Planning for Good Eating," 10 minutes, stresses nutrition. "Environmental Sanitation," 10 minutes, shows how to protect health through sanitation. These films may be purchased from the Institute, which is located at 499 Pennsylvania Ave., Washington, D. C., at reasonable prices; also some preview prints are available.

BOOK REVIEW

Water Supply and Sewerage. By Ernest W. Steel, Consulting Engineer to Instituto Nacional de Obras Sanitarias, Venezuela. 666 pp., 264 ills. McGraw-Hill Book Co., N. Y., $6.

This is the second edition of Prof. Steel's book, the first having appeared in 1938. Considerable additional information has been added to cover the developments in water supply, water purification, sewerage and sewage treatment that have occurred since that time. The employment of free available chlorine residuals; the later developments in water softening and in correction of water to prevent corrosion or scale; and the use of high-rate filters are the principal additions to this book. It is a good book, with perhaps a slight Texas slant in some places.

LETTERS TO THE EDITOR

How About It, Los Angeles?

Sir: In your issue of August, you stated that it was the opinion of the City Fathers of Los Angeles that theirs was the only fully electric asphalt plant in the United States. Such is not the case, as we have had two in Washington since 1938, each being as large as the one mentioned in the article.

L. C. Hammond, Superintendent,
Corson & Gruman Co.,
Washington, D. C.

A True Sanitary Engineer:

In an interesting letter just received from Jack J. Hinman, jr., who was recently promoted to the grade of Colonel, Corps of Engineers (congratulations, Jack) and is on duty in Japan, with the 8th Army, he says: "(My wife) has been much perturbed with the amount of photographing I have done of honey carts, etc. She says no one but her husband would have noticed that the honey carts of Sendai are different from the honey carts, or rather the honey buckets, of Yokohama, and insisted on photographing same." Further, he says: "Are there any good men . . . who are likely to be interested in any of the several P5 vacancies we have here in the engineer section?"

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NEW MODEL 87
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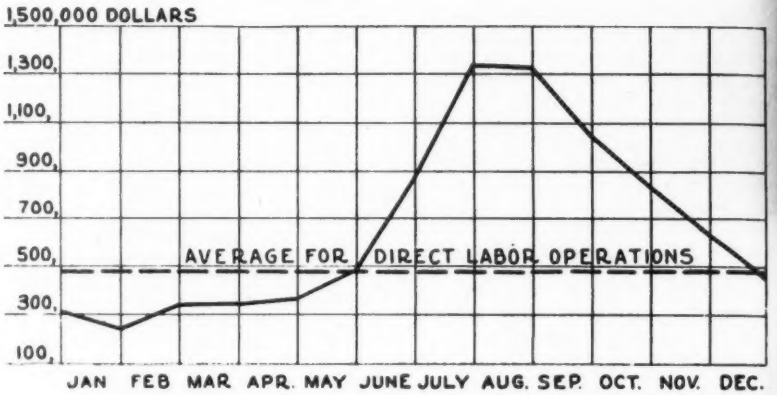
The Highway and Airport Digest

Contracting Road Maintenance

Minnesota is one of those states that utilizes the contract system wherever and whenever possible. This policy has encouraged and developed a large number of contractors, who with their organization are fully familiar with our problems and requirements. They bid aggressively and competitively for the work, and usually complete it within the short periods of time specified on most maintenance jobs. No project is too small or too large to attract these contractors if the work requirements are clearly set forth and the basis of payment plainly defined. Having a group of contractors available for doing seasonal and emergency work makes it possible for the public or day-labor organization to be kept at a level of maximum efficiency for year-round employment.

The graph shows the monthly variation in maintenance expenditures and benefits of utilizing contractors. The horizontal line represents average expenditures by direct labor operations. The curve above this line is just about equivalent to our contract expenditures. If all the work were being done by direct or day labor, it is quite likely that the expenditures in the low-month periods would be higher and inefficient, while some of the operations in the higher-month periods would not be reached unless more funds were provided.[O35]



Courtesy Roads & Bridges

Monthly variation in Minnesota maintenance expenditures.

Soil Surveys For Road Work

In general, a soil survey involves: 1. The exploration of soil conditions over the site by boring or otherwise, and the preparation of a section or sections indicating the nature of the ground; and 2. The examination and testing of samples of the soil taken from the site and the reduction of the information to engineering recommendations.

The information obtained should permit the establishing of 1. Suitability of the proposed location both horizontally and vertically. 2. Selection of suitable materials for embankments. 3. Cross-sections of cuttings and embankments. 4. Earthwork quantities; bulking or shrinkage; volume of rock excavation. 5. Subsoil and surface drainage requirements. 6. Thickness of carriageway pavement. 7. Need for treatment of subgrade and type of treatment required. 8. Suitability of local materials for the construction of stabilized bases. In general, a soil survey will provide vertical sections showing the nature of the soil in different strata. It can be carried out rapidly by hand-boring methods, using a post-hole auger of 4" or 5" diameter.[O37]

Plastic Road Markings

War conditions in England made it impossible to obtain paint suitable for white-line road markings, and the Road Research Laboratory developed two substitutes—a thermoplastic white line and a surface-dressed line. The former uses a white aggregate not larger than ⅛", mixed with a binder of varnish fume or fluxed resin. These cost about 2¼ times as much as paint, but last 1 or 2 years while paint lasts 1 to 6 months. The surface-dressed line consists of a narrow strip of surface dressing using an ordinary bituminous binder and a white aggregate. To give good visibility, the line should be at least 6" wide. Such a line costs 25% more than paint but lasts 1 to 4 years.

Both plastic and surface-dressed white line road markings are more economical than paint, owing to their very much longer life for only a small extra cost. Under favorable conditions surface-dressed lines will yield a performance equal to that of plastic lines for an appreciably lower cost.[D26]

Combination Airport Drains

Ellington Field, Texas, was reconstructed in 1941, and combination drains were installed for both surface and subsurface drainage. The area is flat; predominant soil is heavy clay to silty clay. Average annual rainfall is 45.92". Watertable elevations varied from a few feet to 10 ft. below the surface. Drains along all runways and aprons are of a combination type. Intermediate areas are traversed by perforated metal pipe laterals with pervious backfill and catchbasins, cover over the pipe varying from 2 to 5 ft. Sizes were based on a 1-yr. frequency storm of 1.75" for one hour; but rainfalls exceeding 2" have occurred 4 times since the drains were laid. The field has never been out of operation because of flooding. The subgrade has given good support to the pavement, which has carried without cracking much heavier loads than it was designed for. The only silting that has occurred was a stretch of pervious cap along an apron where a sodded area sloped toward it, contrary to the plans. The entire drainage system was in excellent condition last year after 5 yr. of operation.[E42]

Equipment for Laying a 25" Concrete Slab

In laying 10,000 ft. of 300-ft. runway 21" thick and a parallel 150-ft. taxiway 25" thick (see "Digest" for Dec. 1946) on an airfield near Dayton, O., the contractor began the 1947 season with three 34-E dual pavers, two laying the bottom 17" and the third the top 4", mesh reinforcement being placed between. This did not give speed enough, there was no room for more pavers, so two 34-E pavers were used as a stationary plant and the concrete hauled from them in 2.8 cu. yd. dump trucks, while two similar pavers along

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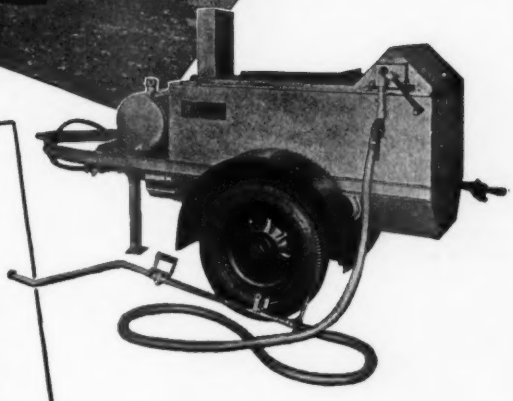
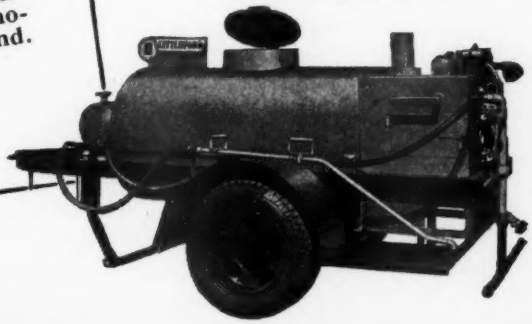
REPAIR WITH LITTLEFORD UNITS

LITTLEFORD POWERED TRAIL-O-ROLLER has compaction of five-ton tandem; trails at any speed; easy to operate, efficient, economical.



Night and day your roads are being pounded by endless traffic. It can't let up and neither can your repair crew. Track down pavement breaks with Littleford bloodhounds. The 84-HD Kettle can repair any road by applying asphalt to stones, gravel, etc. The 84-HD includes double heat circulation and screened reservoir, and these features assure faster heating, faster draw-off of material, and the safest and most economical kettle operation. Combine with Littleford's famous Trail-O-Roller and their No. 101 Utility Spray Tank and you have a combination that really makes for speed and economy, and that's what you want the year round. It's the antidote to black top disrepair!

Littleford 101 Utility Spray Tank is combination of three units: Spray bar for spraying, hand spray for patch work, pouring pot outlet for filling cracks.



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the forms added their output direct; the total output approaching 240 cu. yd. per hr. Another paver was to be installed in July. The trucks dump between the forms by backing onto a low-bed trailer drawn along the subgrade. The first concrete lift is struck off by a heavy Blaw-Knox spreader provided with six speed vibrators. The top lift is finished with two Jaeger-Lakewood finishers. Special Heltzel forms are used with 21" and 26" sides in 12-ft. lengths weighing 800 lb. each, which are hauled on rubber-tired trailers and handled by a special front-end lifting device mounted on a wheel tractor, which also pulls pins and loads the panels for the move-up. The batching plant comprises four 100-ton-double-compartment bins, capable of 280 batches per hour.[N66]

Mixing Air Entrained Concrete

Chicago, Ill., uses air-entrained concrete for its street pavements, and the Commissioner of Streets has made tests to determine how best to control the air content. The air entraining admixture used was Darex AEA. Difficulty was found in maintaining a constant slump, possibly due partly to varying amounts of free moisture in the fine aggregate. "Results show that controlled air in concrete can be obtained by addition of a satisfactory air entraining admixture to normal portland cement at the mixer. An average air content of 4.3% was obtained with a range of 2.3% to 6.0%. Apparently some variations in the sand, particularly passing the 100-mesh sieve, serve as air entrainment depressants." Adding the agent at the mixer instead of using an air entraining cement placed in the trucks at the yard has the advantage that if tests of the concrete on the job indicate the desirability of changing the amount of the agent, the change can be made immediately.[N67]

Growing Grass Under a Bitumen Film

Tests of growing grass under a thin film of bitumen have been made in England and demonstrated that the film conserves the heat present at the time of sowing, draws up moisture to the surface from a considerable depth, and prevents germination of air-borne seeds of weeds. Ordinary highway asphalt emulsions were used, sprayed on at the rate of 6 or 7 sq. yd. per gallon. A thin layer of clean, sharp sand was spread over the seed under the film and another layer above the film.[P27]

Lime as an Admixture for Roads

Lime has been used in Texas as an admixture with local materials otherwise unsuitable for making low-cost roads. The highway department has found that "borderline gravel with high P. I. clay binder, unfit for use in its natural state, can be vastly improved by an admix of about 3% of lime. All the constants are greatly improved. . . . Many thousands of cubic yards of doubtful clay-gravel can be improved by these changes to meet all the standard tests." The testing laboratory at Austin has shown that all soils except gypsum and peat can be improved by admixes of one kind or another, and that an admix of lime changes all the constants in clay for the better. Treating one clay with 8.5% of lime changed an A-7 soil to an A-5, and it then resembled soft fine-grained sandstone; P.I. was reduced from 45 to 7; LS from 24 to 7; SR from 2.0 to 1.43.[N68]

Designing Highways for Safety

Factors to be considered in designing for safety are volume, speed and composition of traffic, and topographical features which affect highway alignment and sight distance. Design speed, sight distances, number of traffic lanes, type of highway and width of lanes are decided upon with reference to these factors. Design speeds on rural primary trunk lines may be fixed at 70 mph on level terrain and 60 in rolling sections; while 50 mph is adequate for expressways in urban areas. On 2-lane and 3-lane highways, a safe design speed of 50 mph requires sight distances of 1,600 ft., 60 mph requires 2,300 ft. and 70 mph requires 3,200 ft. Where these dis-

"... the best investment the City has ever made."

The City of Shaker Heights
Cuyahoga County, Ohio

February 13, 1947

Baughman Manufacturing Company
Jerseyville, Illinois

Gentlemen:

Last year the City of Shaker Heights, Ohio, purchased from your distributor, The Ohio Truck Equipment Company of Cleveland, Ohio, two (2) of your Model K material truck body spreaders for the purpose of spreading salt and cinders on the streets in Shaker Heights.

These spreaders have proven satisfactory in every respect and I feel that they are the best investment the City has ever made for any type of equipment.

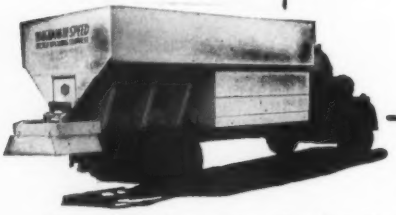
We are able to keep all of our streets clean and free of ice during the severest winter weather, thereby preventing serious accidents and traffic congestions.

I hereby highly recommend the Baughman material spreaders to other cities and municipalities.

Very truly yours,

Director of Public Service

BAUGHMAN
CINDER SPREADER



The fast, economical way to spread cinders, sand, salt, chips, etc. The BAUGHMAN Spreader gives you effective ice control in winter . . . speedy material distribution in all seasons. Saves time . . . makes more efficient use of manpower.

Speeds up to 25 m.p.h. . . . spreads from 8 to 30 ft. Built-in heater to keep material flowing in sub-zero temperatures. Special baffle plates to keep spread within desired area and to prevent injury to pedestrians and damage to parked cars. Completely regulated volume.

Built of abrasive-and-rust-resistant alloy steel. Genuine Timken bearings . . . heavy hardened cut-steel gears. Capacities from 9 to 17 cu. yds.

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tances are not provided, passing should be prohibited. For a 4-lane road, speeds of 50 and 60 mph require sight distances of only 350 and 475 ft.

On a 2-lane road, safe passing is almost impracticable where more than 400 vehicles per hour use the opposing lane, or say 600 vehicles in both lanes. The working capacities of 3-lane, 4-lane undivided and 4-lane divided highways are 5,250, 10,500 and 14,000 vehicles per average 24-hr. day. A study of 22,000 accidents on 5,000 miles of rural highways in Michigan during a period of six years, shows (per million vehicle-miles) 1.7 accidents on 2-lane, 2.0 on 3-lane, 2.5 on 4-lane undivided and 1.3 on 4-lane divided. On a New Jersey road, changing from 4-lane undivided to 4-lane divided resulted in a 40% reduction in total accidents and an 83% reduction in fatal accidents.[P28]

Soil-Cement Base Courses After 8 Years

In 1938 the So. Carolina State Highway Dept. in cooperation with the Public Roads Administration constructed an experimental road to study the effect of variations in base thickness, quantity of cement and method of curing on the service behavior of soil-cement base courses. Courses were made 4", 6" and 8" thick, and with cement contents varying from 3% to 11%, and two sections were built without cement but with the addition of crushed stone and screenings. In 1946 this road, which had carried an average traffic of about 500 vehicles a day for 8 years, was examined and the conclusions drawn were as follows:

Portland cement used as an admixture was found to be effective in altering the physical properties of the soil, and this alteration was a major factor in the success of the soil-cement base. One important change effected by the addition of cement was a reduction in the plasticity indexes of the soils.

The addition of cement to the soil increased the durability of the base course, as observed in field performance and as measured in the laboratory by increased resistance to deterioration from wetting and drying and from freezing and thawing. Each increase in the proportion of cement to soil correspondingly increased the quality of performance of the base course.

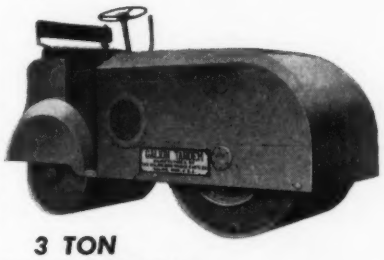
Soil-cement base courses 6 inches thick, with cement content of 9 percent, and constructed on the more friable soils, gave satisfactory performance for the full 8 years. As might be expected, the soil-cement base courses on friable soils gave better performance than comparable bases on the more plastic soils.

A 3 percent cement content was not sufficient to produce required base-course stability, even when the base thickness was increased to 8 inches.

Soil-cement bases 4 inches thick were inadequate even with cement content as high as 9 percent.

Use of a surface application of asphalt emulsion or tar as an aid in curing the soil-cement base courses

NO JOB TOO SMALL
NO JOB TOO LARGE
for



3 TON
Variable from 3 to 5 tons

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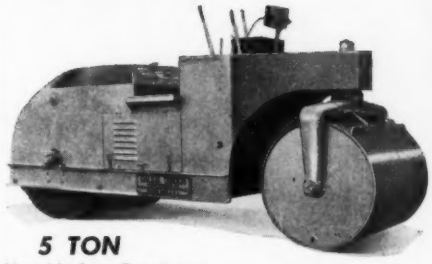
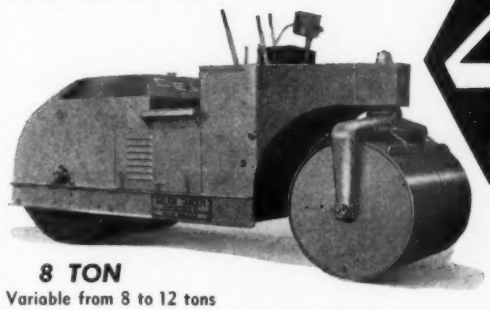


5 TON
Variable from 5 to 8 tons

4 SIZES
VARIABLE
WEIGHT



8 TON
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are "never too light--never to
heavy" on any job of compactio
By adding or removing wate
ballast in the rolls of a GALIO
Tandem, you can get the exac
weight best suited for the specifi
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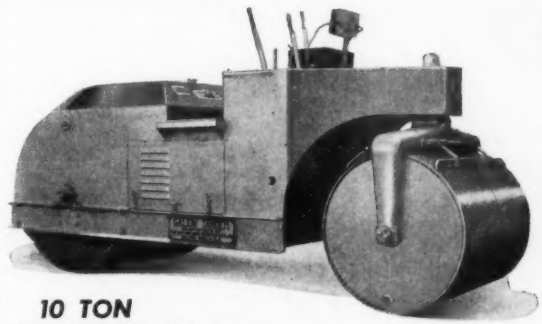

10 TON
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40 YEARS OF EXPERIENCE
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proved beneficial, the emulsion producing superior results.

Admixtures of granular material and soil, without cement, gave performance equal to or better than soil-cement mixtures, and at no greater cost. The excellent performance of the stone-stabilized base courses agrees with long experience in which good results have been achieved by this low-cost construction method.[U9]

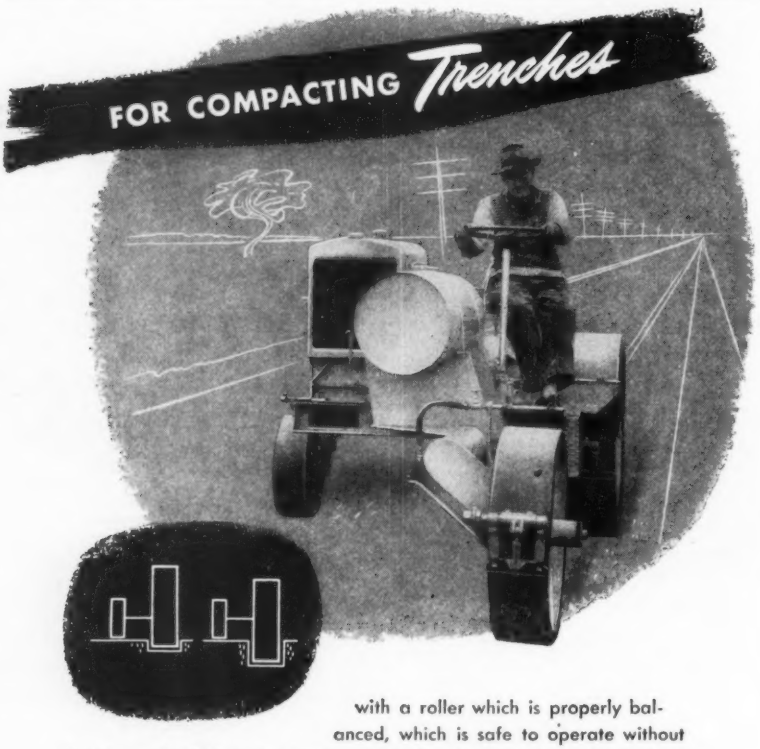
Fill on Mud Foundation

The Bayshore Freeway, Calif., traverses reclaimed land under which is mud to depths up to 60 ft. Embankment up to 7 ft. high is being placed on this, with an overload of 2 ft. to accelerate settlement, which overload is removed after 30 days. In some deep mud areas and near structures, consolidation is aided by the sand drain method (described in the *Highway Digest* for April, 1947). Where the mud depth is less than 20 ft. the mud is stripped before placement of embankment material. Where no special treatment is used the embankment is placed on the original ground at a slow rate so that it will consolidate without being displaced—not over 12" a day or 3 ft. during any one week.

Settlement platforms, 3 feet x 4 feet x 3 inch dimensions, were placed on the original marsh prior to the start of construction. A section of iron pipe was attached to each platform with the top of the pipe kept above the top of the fill by the addition of lengths as the fill heights were increased. The rate of settlement and total consolidation are readily obtained by means of elevations taken on the tops of the pipes. Permanent installations are planned which will permit future observations after completion of the project.[W4]

Radio Control on Bridge Six Miles Long

San Francisco-Oakland Bay bridge is 6 miles long, traffic on it averages 70,000 cars a day, and as there are no parking facilities, stalled vehicles obstruct traffic; and these average 35 a day and have reached 80. Four state-owned tow cars are in constant readiness, supplemented during peak hours by 4 pick-up trucks equipped for changing tires, supplying gasoline and extinguishing fires; and in addition there is an electrician's truck, fire engine, fire chief's pickup, and traffic engineer's sedan. These are equipped with two-way radio equipment which transmit on 156.45 megacycles at the main station and 156.69 in the mobile units. These high frequencies penetrate the entire length of the Yerba Island vehicular tunnel, which lower frequencies do not. The dispatcher, sitting at his microphone with a chart before him showing the position of all equipment, can direct the units by radio with the greatest efficiency.[W5]



with a roller which is properly balanced, which is safe to operate without tipping, and which is designed specially for that job. A simple, hydraulically operated mechanism provides vertical adjustment for the road wheel so that the roller can be kept level when operating in the trench. This hydraulic unit is exclusive with Buffalo-Springfield trench rollers. Compressions exceeding 300 #/" of face can be obtained with this model. See your Buffalo-Springfield distributor for further details.

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Bibliography of Highway and Airport Literature

D *The Surveyor (England)*
August 8

26. Plastic and Surface-Dressed White Line Road Markings. By A. T. J. Hayward. Pp. 415-416.

August 15

27. Developments in Road Bridge Design. By J. E. Jones. Pp. 931-932.

August 22

28. Road Surfacing Machinery and White Line Markings. Pp. 443-444.

E *Engineering News-Record*
August 21

42. Combination Airport Drain Proves Its Value. By John M. Robertson. Pp. 102-103.

L *Civil Engineering*
September

12. Economic Justification of Highway Improvements Confronts Arizona. By E. V. Miller. Pp. 21-25, 74.

N *Roads and Streets*
August

66. Paving the Most Massive Concrete Runway in the World. Pp. 55-65.
67. Air Entrainment Control Test Project Completed in Chicago. By C. John Chambers. Pp. 73, 75, 112.
68. Lime Stabilization and Low Cost Road Construction. By W. D. Dockery. Pp. 91-94; and D. E. H. Manigault, Pp. 94-95.
69. Cost Accounting Plan for County Roads. Pp. 97-99.

O *Roads and Bridges*
July

35. Responsibilities of a Highway Maintenance Organization. By C. L. Mott. Pp. 50-52, 72.
36. Granular Stabilization. Pp. 53, 82.
37. Soil-Survey Procedure for Road Work. By A. H. D. Markwick and S. B. Webb. Pp. 58-62, 87.

P *Public Works*
September

28. How Modern Highway Design Reduces Accidents. By Harry C. Coons. Pp. 21-23, 34.

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29. Washington State Highway Maintenance Speeded by 2-Way FM Radiotelephone. By Fred E. Ebel. Pp. 28-30.

U *Public Roads*
July-August-September

8. Triaxial Compression Test Results Applied to Flexible Pavement Design. By E. S. Barber. Pp. 1-8.
9. Experimental Soil-Cement Base Course in South Carolina. By E. A. Willis. Pp. 9-19.

W *California Highways and Public Works*
July and August

4. Unstable Foundation Conditions on Bayshore Freeway. By H. A. Simard. Pp. 10-13.
5. Two-Way Mobile Radio System on San Francisco-Oakland Bay Bridge. By H. C. Snead. Pp. 18-19, 26.

Y *Contractors Record (England)*
August 13

8. Road Junctions: Suggestions for Improved Designs. By G. T. Bennett. Pp. 16-20.

August 20

9. Road Junctions: Suggestions for Improved Designs. By G. T. Bennett. Pp. 28-33.

On-the-Job Training for County Highway Work

A schedule of on-the-job training for county road work has been sent us by Emmon Robbins, County Engineer, Thomas Co., Kansas. The schedule is set up in two main divisions—construction and maintenance.

Under construction training are included *earthwork,* with lineal grading, embankment and excavation and finish blading; *drainage structures,* including culverts, headwalls and wings, timber and concrete bridges, metal arch bridges, and wash check construction; and *gravel surfacing,* including production of gravel, windrowing and spreading, and scarifying and compacting. Instruction is also given on hand and machine methods for embankments and excavation, the latter including dump trucks and elevating graders, excavators and scraper equipment.

The instruction on maintenance is very complete. *Surface maintenance* subjects include blading gravel and dirt roads with motor patrols, under both wet and dry conditions; shoulder reshaping using patrols and blade graders; back sloping with the same types of equipment; graveling, including locating suitable material, loading by hand and machine, windrowing and spreading. *Snow removal* instruction covers blading with a motor patrol, the use of truck mounted snow plows and the erection and maintenance of snow fences. *Drainage structures* include culvert replacement, pile trestle bridge repairs, care and maintenance of wash checks, and concrete and metal arch bridge maintenance and repair. *Roadside maintenance* covers placement and erection of highway signs; field maintenance of signs, guard rails and posts; and weed eradication by mowing, dragging and burning. *Shop work* covers the proper maintenance of machinery and trucks, daily operating reports and small miscellaneous repairs.

The Editor congratulates Mr. Robbins and Thomas County on this program and hopes that it will be extended to other counties.

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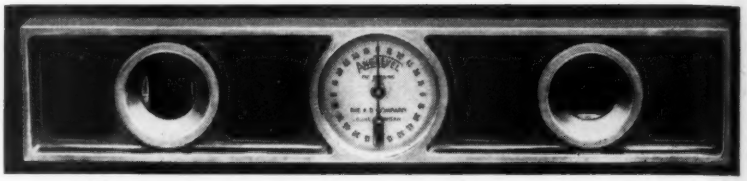


The RS construction aid.

Air Compressor Developments by Le Roi

An "85" Airmaster, on a 2-wheel pneumatic tire mounting has been announced by Le Roi Co., 1706 So. 68th St., Milwaukee, Wisc., but it is also available on wooden skids. The operation is regulated by the "econotrol" and the unit has electric starting and electric hourmeter. A "105" Airmaster has also been announced. This utility unit weighs only 1700 pounds and can be placed either back of the cab or on the platform of utility trucks. Descriptive material on both or either will be sent on request.

High Speed Street Sweeper

The Lorraine street sweeper operates up to 10 miles an hour, can travel 55 mph. between jobs, and has a hopper capacity of 2 cu. yds. A fine spray settles the dust and revolving gutter brooms whirl the dirt under the truck where it is picked up by the main broom. When the hopper is full, the dirt is dumped in a neat pile by one control. It has a 6'6" sweeping path and is designed to scour hard-to-get-at places. Lorraine, Inc., 1649 18th St., Santa Monica, Calif.

The Newaygo traffic line marker.

The Lorraine is a new high-speed street sweeper.

Marking Traffic Lines Quickly and Easily

In this line marker the painting liquid is held at a fixed level in a reservoir, whence it is transferred by an idler wheel to the marking wheel, which is said to apply the paint evenly and economically. The amount of paint fed is governed by an easily adjusted thumb nut. The unit is light and easy to handle and is intended for quick marking of street crossings, parking spaces, dividing lines, etc. Full information from Newaygo Engineering Co., Muskegon St., Newaygo, Mich.

A Simple and Useful Self-Cleaning Water Strainer

The Brassert self-cleaning water strainer consists of a slowly revolving drum which is contained within a heavy housing and which can be equipped with any of a number of removable types of straining media—porcelain, stainless steel or bronze. Automatic backwash is provided by differential head, using 3% to 5% of the water strained. A small motor operates the drum. The strainer is available in sizes from 3" to 30" pipe. S. P. Kinney Engineers, Inc., Pittsburgh, Pa.

A New Packing for Bell and Spigot Cast Iron Pipe

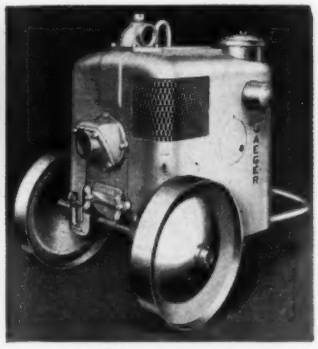
Flexo-Pac is a rubber packing for yarning bell and spigot cast iron pipe. It is quite free from bacteria, speeds up sterilization of mains, helps in making wet joints and is said to be quick and easy to apply. A folder tells about this product and how to use it. Rice-Chadwick Rubber Co., Killbuck, O.

Housings to Protect Pumps

An interesting development in self-priming centrifugal pumps for drainage work is Jaeger's use of overall housings which protect the engine as well as the pump from weather and dirt. Keeping water from sparkplugs, carburetor and

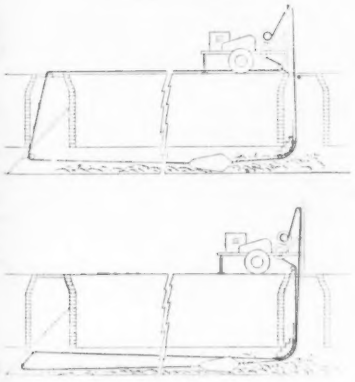
crankcase insures quick starting and more efficient operation, and adds to engine life. Enclosures on small pumps lift off when necessary. On larger pumps, the housings give easier access to engine parts and the entire pump end is hinged to swing completely open.

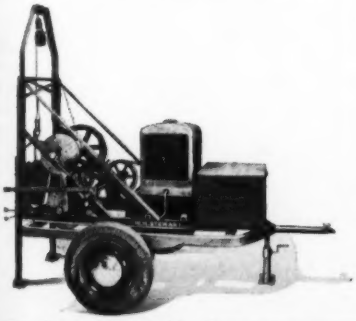
Fast and doubly-sure priming is accomplished by two independent actions



Jaeger pump with housing.

which operate simultaneously. Replaceable liners or seal rings, Jaeger patented "Lubri-Seal," self-cleaning shell design and open-type impellers, which are adjustable for wear, are other advanced features. Jaeger individually tests and certifies each pump for vacuum, capacity and pressure. Catalog P-45, describing the complete line, is available on request from Jaeger Machine Co., Columbus, O.





This shows the double drum power sewer cleaner supplied by W. H. Stewart, Inc., Syracuse, N. Y. Above are two methods of using the machine.

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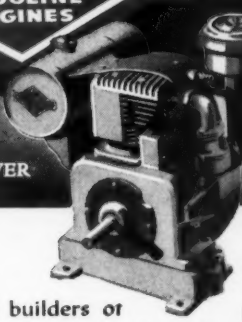

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INFORMATIVE BOOKLETS

Surveying Instruments, 1947 edition, 50 pages. W. & L. E. Gurley, Troy, N. Y. This is an old friend, back in a new dress. It includes the Gurley post-war line of transits, levels, level rods, alidades, topographic instruments, hydraulic measuring equipment, water level recorders, plane tables, drawing boards, current meters, hand levels, and all the other equipment an engineer likes to look at. Sent on request; you'll enjoy looking it over.

Aggregate Facts and Figures, a handy pocket reference published by Pioneer Engineering Works, Minneapolis, Minn., covers aggregate specifications, belt conveyor capacities, crusher settings, horsepower required, screen data, weights of materials, power rating of belts, safe loads on beams and other information the engineer will find handy. Sent on request.

Underpasses and Service Tunnels.—A 24-page manual, with data on sizes and shapes of openings and suggestions on floors, drainage, lighting, brackets and end treatment, for all types of underpasses and tunnels. For your copy, write Armco Drainage and Metal Products, Inc., Middletown, Ohio.

Multi-Zone Furnace for Incineration, 1947, Morse Boulger Destructor Co., New York 17, N. Y. Gives a great deal of information of an engineering nature on incineration of sludge, coarse screenings, industrial wastes, fine screenings, ground garbage and grit. Chart shows performance characteristics for sludge incineration. Sent on request.

Underdrain Blocks.—A bulletin by Infilco, Inc., 325 West 25th Place, Chicago, Ill., illustrating and describing Accelo Hi-Cap underdrain blocks. These were developed especially for high-rate filters, and they provide increased flow and ventilation areas. They are manufactured by Ayer-McCarel-Reagan Clay Co., Brazil, Ind.

Automatic Backwash Sand Filter.—A 4-page bulletin with illustrations and drawings of this filter which is designed for water and sewage effluent treatment. Write Hardinge Co., York, Pa.

Fifteen Building Maintenance Problems.—The most urgent 15 building maintenance problems are discussed in a folder that can be obtained from the Stonhard Co., 403 N. Broad St., Philadelphia 8, Pa. It provides solutions to such problems as leaky roofs, worn flashings and gutters, rough concrete and wood floors, concrete dust, spalled walls, loose pointing, etc. Sent on request.

Stationary Diesel Engines.—A 28-page bulletin on 4-cycle, cold-starting, mechanical injection diesels, with 46 illustrations, 8 performance charts and 5 dimensional blueprints. Ask for No. 4705. Superior Engine Division, National Supply Co., Springfield, O.

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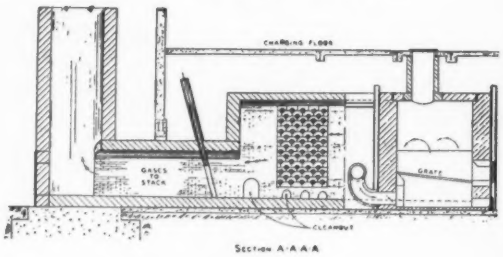

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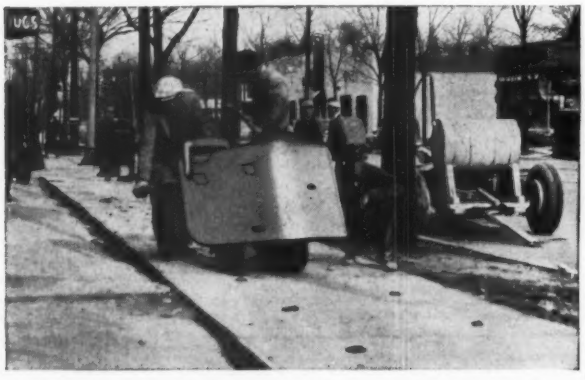

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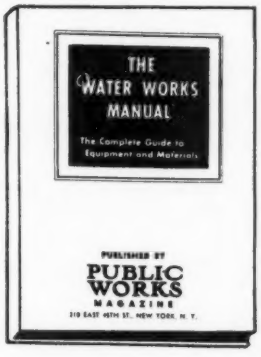
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One to Two H.P. Air Cooled Engine for Dependable Power

523. New bulletin illustrates many uses for Clinton 1 to 2 H.P. gasoline engines. Gives full specifications and power data. An economical, long lasting power unit. Write Dept. PW, Clinton Machine Co., Clinton, Mich.

Got a Building Maintenance Problem?

542. Whether it is floors, walls, foundations, roofs, "Over The Rough Spots," Stonhard Company's new free 48-page booklet is packed with practical answers. Address, Stonhard Co., 883 Terminal Commerce Bldg., Philadelphia 8, Pa.

Find Buried Pipe and Leaks

545. Finding Buried Pipe, Leaks is easy with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 W. Glenoaks Blvd., Glenade 1, Calif.

How to Treat Municipal and Industrial Waters

547. A new 94 page technical bulletin No. 8 on water treatment has sections on softening, purification, taste and odor removal, corrosion control, boiler feed water treatment, the use of alkalies, chlorine and other chemicals and equipment, as well as lists of standard reference works on many of the subjects covered. Offered free by the Solvay Sales Corp., 40 Rector Street, New York 6, N. Y.

Protect Your Grade Crossings With Model 10 Signals

548. Bulletin G15-PW7 describes and illustrates the automatically operated Model 10 railroad crossing signal. Folder describing this signal which guards against "second train" accidents and permits fast flow of rail and highway traffic is available on request from Western Railroad Supply Co., 2406-2436 South Ashland Ave., Chicago 8, Ill.

Clean Your Sewers With a Self-Propelled Sewer Scooter

549. For folder describing the Sewer Scooter which is self-propelled and will clean sewers from 8 inch to 96 inch, write to J. C. Fitzgerald, P. O. Box 289, Coral Gables 34, Fla.

Need a Fast and Economical Air Conditioner?

550. A generous free sample of O. D. 30 together with a folder describing the many uses of this easy to use odorless deodorizer can be obtained by writing to Wonder Wash Corp., Room 1532 G-F, 60 East 42nd Street, New York 17, N. Y.

Want Mosquito and Pest Controls?

607. Two informative folders available now describing and suggesting uses for Neocid M 25 and Neocid D 30, for effective sprays. Address: Geigy Co., Inc., Insecticide Div. 89-91 Barclay St., New York 8.

CONSTRUCTION MATERIALS AND EQUIPMENT

Low Cost Air From Long Lasting Compressor

2. Jaeger air compressors, made in sizes 60 to 500 cu. ft.; trailer, truck, tractor and stationary mounted, gas, Diesel and electric power. Catalog and data. The Jaeger Machine Co., 400 Dublin Av., Columbus 16, O.

Self-Propelled Crane for Every City-County Need

20. Here's a fast, versatile industrial crane with plenty of lift . . . gets there in a hurry on rubber tires . . . one man operates it easily . . . 5 ton capacity—7 ton with outriggers. Send for bulletin PW, Unit Crane & Shovel Corp., 6323 West Burnham St., Milwaukee 14, Wisc.

Travels Fast, Loads All Kinds of Materials Quickly

22. New Eagle Truck-Mounted Loader, operated by truck driver, goes from job to job at truck speed. Loads all kinds of material quickly. No costly working parts. Ask for new bulletin PW. The Eagle Crusher Co., Inc., Galion, Ohio.

Improve Appearance of Curbs, Gutters, Sidewalks

78. Curb and Gutter and Sidewalk Forms, including battered face curb form especially for modern traffic conditions. Last 20 years or more. Send for new engineering data Bulletin A-20-F, Dept. P.W., Heltzel Steel Form & Iron Co., Warren, O.

Handle All Kinds of Tough Grading Jobs Economically

98. The Austin-Western 99M Power Grader with its powerful all wheel drive handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow ploughing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Dept. P.W., Austin-Western Co., Aurora, Ill.

Save Money, Busting, Cutting, Digging, etc.

110. Powerful self-contained gasoline hammers illustrated in new booklet. Used as paving breakers and spike drivers. Easily portable, economical. Write Syntron Co., 660 Lexington, Homer City, Pa.

Methods of Installing Steel Sheet Piling

112. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Steel Co., Dept. P.W., 1820

Reliable Every Purpose Pumps

117. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

Make Low-Cost Electricity From Cheap Fuel

422. New booklet describes Sheppard Diesel Generating Sets that make low cost electricity from cheap fuel and give dependable service in the hands of any average operator. Write R. H. Sheppard Co., 250 Middle St., Hanover, Pa.

Tandem Roller with Air Clutches Starts and Shifts Easier

515. Finger tip steering, air clutches, full visibility all around, low center of gravity, handy location of key parts, all gear drive are features of new Apsco tandem roller. Write for bulletin: Dept. PW, All Purpose Spreader Co., Fuller Road, Elyria, Ohio.

Air Cooled Engines for Hundreds of Applications

524. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "night" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wisc.

Practical Portable Power Units for Every Need

533. M-M power units with heavy duty engine, positive lubrication, easy servicing, handy controls may be just what you have been looking for. Simple, durable, practical. Get latest bulletin from Dept. PW., Minneapolis Moline Power Implement Co., Minneapolis 1, Minn.

Save a Man on Surveying Work

540. New Odometer measures as you walk. Ingenious labor and money saver for surveyors described in illustrated circular. Address: Matthews Instrument Co., 1129 Boylston St., Newton Upper Falls 64, Mass.

Two-Way FM Radio Telephone Equipment for All Departments

541. For booklet describing and illustrating the Motorola Two-Way Radio Telephone or for specific recommendations concerning your aplication write to Dept. PW, Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Ill.

Need an Efficient, Economical Air Compressor?

543. Davey Air Compressors, either trailer type or truck mounted, offer efficient and economical operation. For details on models 105 and 210 write Dept. P.W., Davey Compressor Co., Kent, Ohio.

Mechanical Testing Screen For Stone, Gravel, Slag, etc.

606. Gives fast, accurate sizing of test samples. The Gilson Testing Screen handles a large sample in three to five minutes. For bulletin giving complete details on this screen which has a size range from 4 inches to 200-mesh write Dept. P.W., Gilson Screen Co., Box 186, Mercer, Pa.

SNOW FIGHTING

For High-Speed Snow Removal

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Frink Sno-Plows, Inc., Clayton, 1000 Islands, N. Y.

Fast, Efficient Skid-Proofing

355. Get full facts about Baughman Light-Weight Cinder Spreaders, fast operators for cinders, sand, salt, chips, etc. Free flowing at low temperatures. 9-17 cu. yd. cap. Write Dept. P.W., Baughman Mfg. Co., Inc., Jerseyville, Ill.

STREETS AND HIGHWAYS

Solve Your Drainage Problems This Easy, Permanent Way

70. Useful new 60 page catalog on standard corrugated pipe, multi-plate pipe and arches and 18 other drainage and related products for culverts, sewers, subdrains, flood control, airports, water supply and other types of construction. Ask for "Armco Products for Engineering Construction," Armco Drainage and Metal Products, Inc., Dept. PW Middletown, Ohio.

Levels Sidewalks and Curbs Quickly and Easily

107. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee 10, Wis.

Speed Your Work With These Powerful Motor Graders

128. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Strong, Speedy, Low-Cost Maintainer Has Many Uses

130. BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Full details in illustrated folder. Huber Mfg. Co., Dept. P.W., Marion, Ohio.

Tandem, 3 Wheel and 3 Axle Road Rollers

138. "The Buffalo-Springfield" line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog P.W. issued by the Buffalo-Springfield Roller Co., Springfield, Ohio.

Looking Into Soil Stabilization?

154. "Soil Stabilization with Tarvia"—An illustrated booklet describing the steps in the stabilization of roadway soil with Tarvia will be mailed on request by Dept. P.W., The Barrett Division, 40 Rector St., New York 6, N. Y.

Here's Your Diesel Tractor!

190. Big 48 page catalog describes and lists many uses for International Diesel Tractors. Write International Harvester Co., Dept. P.W., 180 North Michigan Ave., Chicago 1, Ill.

Latest Maintenance Equipment For Blacktop Roads

290. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

Mow Clean and Fast In Tight Corners

510. Send for latest literature about the Cunningham Mower for Fence Rows, Parking Areas, Driveways, Picnic Grounds and many other jobs. 3 ft. cut, variable speed, rugged, easy to handle. James Cunningham, Son & Co., Dept. 16, 13 Canal St., Rochester 8, N. Y.

SEWAGE DISPOSAL

How You Can Clean Sewers From Streets Easily and Inexpensively

386. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boulevard, Los Angeles 34, Calif.

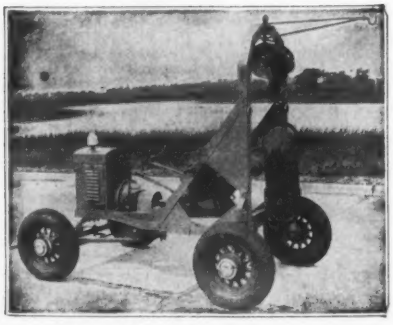
How Cities Can Do Complete Sewer Cleaning From Street

387. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Three sizes of machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

All About Flow Meters

409. The primary devices for flow measurement—the orifice, the pitot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (No. 300). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa.

KEEP THOSE SEWERS OPEN!



Sewers clogged with sand, roots and other debris are a constant danger to public health and safety. New installations rapidly lose their efficiency due to sand seepage.

You positively can keep the sewers of your city open with an OK Champion—the cleaner that does the entire job from street level. Dig-ups practically a thing of the past.

Three Distinctive Models Available. Write Now for Literature.

CHAMPION CORPORATION
4752 SHEFFIELD AVENUE, HAMMOND, INDIANA

NOW Rolled from Alloy or Mild Steel

Caine CORR-PLATE Steel Piling

Rolled from a new steel alloy, Caine Corr-Plate is now 25% stronger and has nearly 100% greater corrosion resistance. This alloy makes available equal strength and nearly double the life in a 25% lighter piling. Approved by Highway Departments and U. S. Engineers.

Caine Corr-Plate Steel Piling has been used the world over for Foundations, Dams, Retaining Walls, Docks, Levees, Bulkheads, Sewers, Disposal Plants and hundreds of other jobs—It's stronger, lighter, nestable, easy to drive and water tight; can be re-used again and again.

Doubled life and 25% greater strength make Caine Corr-Plate Steel Piling the bargain buy in piling!

NOW, MORE THAN EVER BEFORE...
STRONGEST PER POUND WEIGHT

CAINE STEEL COMPANY
STEEL PILING DIVISION, 1820 N. Central Avenue, Chicago 39, Illinois

9278

USE COUPON ON PAGE 69

How to Select Main Line Meters

432. New bulletin illustrates Builders Air Relay system for liquids containing suspended solids like sewage. Eliminates corrosion, clogged pipes, etc. "The Selection of Main Line Meters," a highly informative and useful presentation, describes forms of differential producers and quickly solves typical problems with the use of graphic charts. Write Builders-Providence, Inc., Dept. P.W., 9 Codding St., Providence 1, R. I.

How to Make Concrete Pipe on the Job

440. Making concrete pipe on the job to give employment at home is the subject of a booklet sent on request by Quinn Wire & Iron Works, 1621 12th St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms.

Concrete Pipe With Greater Elasticity

442. Lock Joint Reinforced Concrete Sewer Pipe, Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

How to Make Better Sewer Pipe Joints

447. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Dept. P.W., Adams, Mass.

Here's Data on All Kinds of Pumps

458. Performance data and illustrations on all kinds of pumps for all uses. Address: Dept. P.W., American Well Works, Aurora, Ill.

An Incinerator Necessity

463. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Dept. P.W., Plainfield National Bank Bldg., Plainfield, N. J.

How You Can Dispose Of Sewage Solids

464. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp., 60 Wall Tower, New York 5, N. Y.

Ask for This Design Data On Sprinkling Filters

469. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., Dept. P.W., 4241 Ravenswood Ave., Chicago 13, Ill.

Design Details for Sludge Collectors

480. Booklet No. P.W. 1642 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, installation pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

Packaged Sewage Treatment—Just Right for Small Places

488. "Packaged" Sewage Treatment Plants specifically developed for small communities — 100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Look Into This Sewage Treatment Equipment

490. New bulletin P.W. fully describes and illustrates Hardinge sludge collectors

YOUR TOWN CAN HAVE EFFICIENT, SANITARY RUBBISH DISPOSAL

Join other progressive cities who enjoy clean, economical rubbish collection with the Dempster-Dumpster system. Detachable truck bodies—rubbish depositories—placed where needed, receive the rubbish . . . a truck hoisting unit picks them up when needed, hauls, dumps and returns them to place. Entire operation handled by truck driver. One truck hoisting unit with several bodies does the work of 4 or 5 ordinary trucks. A type of body available for every requirement. Write today for complete information.

DEMPSTER DUMPSTER
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DEMPSTER BROTHERS, INC.

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KNOXVILLE 17, TENN., U. S. A.

Whether you're BUSTING concrete DIGGING thru shale and hardpan or TAMPING backfill—

SYNTRON

Gasoline Hammer

PAVING BREAKERS

Will Save You Money And Time

100% self-contained—no air compressor to tow around—no battery box or cable to fuss with—just stow it in your service truck and it's always ready for immediate use.

It will help your crews do those tough jobs easier and faster. Investigate its advantages—

Write for illustrated folder.

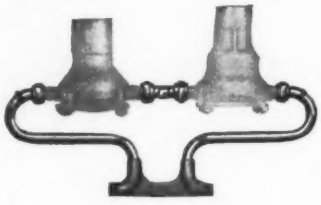
SYNTRON CO.

660 LEXINGTON **HOMER CITY, PA.**

USE COUPON ON PAGE 69

TANDEM RESETTERS

To check one meter directly against another in service, either to compare performance or to satisfy a doubting customer, the Tandem Resetter provides the simplest and easiest means of making the connection.



To use, it is only necessary to remove the meter from its regular position, connect in the Resetter bar, and then install the two meters in series.

Write for catalog.

The FORD METER BOX COMPANY, INC.
Wabash, Indiana

STOP locating LEAKS the hard way!

Use the Globe GEOPHONE

Registered in U. S. Patent Office

To Locate Water or Steam Leaks WITHOUT ANY DIGGING!

Fast, dependable, accurate—the Globe Geophone is far superior to any other leak locater. One water dept. located three bad leaks within two hours . . . their first time using the Globe Geophone! Complete outfit including handy carrying case costs only $75.

Pipe Phones, $3.70 Pipe Finders, $100
Dipping Needles, $18.50

Send for leaflets

Globe Phone Mfg. Corp.

Manufacturers of Geophones Since 1918

DEPT. P READING, MASS.

for clarifiers, sludge concentration and skimming in both circular and rectangular tanks. Write Dept. P.W., Hardinge Company, Inc., York, Pa.

How to Stabilize Lime Softened Water

498. Engineering Bulletin describes stabilizing lime-softened water by recarbonation, discusses gas production, washing, compressing, drying, and applying the CO (2). Infilco, Inc., 325 West 25th Place, Chicago 16, Ill.

For All Sludge Dewatering

601. The first filters to be used in large scale operation on primary, elutriated and Guggenheim sludges. Ask for latest engineering Bulletin P.W. General American Process Equipment Div., 10 E. 49th St., New York, N. Y.

Low Cost Air for Sewage Disposal

602. All interested in low cost air for sewage disposal will want a copy of this useful booklet. Describes operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Biofiltration for Economical Secondary Treatment

605. Biofiltration means lower first cost of filters, control of recirculation rates, less operating personnel, no fly and odor nuisance. Get all details in bulletin PW today from the Jeffrey Mfg. Co., 947-99 No. Fourth St., Columbus 16, Ohio.

WATER WORKS

Hydraulic Pipeline Scraper For Water and Sewage Mains

382. For a copy of this compact folder on a hydraulic pipeline scraper which cleans all kinds of mains from 4 inches to 14 inches write to Dept. PW, Carver-Stimpson Pipe Cleaning Co., Walters, Okla.

Solve Corrosion Problems With This Special Alloy

391. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

To Measure, Mix, Feed Chlorine or Other Gases

397. Everson SterElators. Bulletins 1063, 1066, 708 and others describe this device for measuring, mixing and feeding chlorine or other gases in solution. Capacities range from ¼ lb. to 2,000 lb. of gas per 24 hours. Address: Everson Manufacturing Co., 214 W. Huron St., Chicago 10, Ill.

All Types of Valves, Hydrants And Fittings

413. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Aniston, Ala.

Complete Data on Gates, Valves, Hydrants

414. Gate Valves. Double disc bronze mounted, sizes 2" to 72", hand, hydraulic, electric or pneumatic operating, rising or non-rising stem. Bulletin X. Address: Rensselaer Valve Co., Troy, N. Y.

88 Page Book Helps Solve Water Problems

423. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 88-page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

It's Easy to Use This Leak Locator

426. Leak Locators. Again available to waterworks superintendents, the Globe line of leak locators, dipping needles and pipe finders. Several leaflets describing the orig-

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WATER FILTRATION PLANTS AND EQUIPMENT • ZEOLITE SOFTENERS
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PRESSURE FILTERS • SPECIAL WATER TREATMENT EQUIPMENT

The plus values that come with Roberts Filt equipment are intangibles of long experienc engineering skill and the ability to work wi others.

We invite the opportunity to cooperate wi individuals and organizations interested in th correction of water, either for municipal or in dustrial requirements. Your request will brin full information on the application of our prod ucts and services.

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STREET, SEWER AND WATER CASTINGS

Various Styles, Sizes and Weights
Manhole Covers and Steps
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Adjustable Curb Inlets
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Cistern and Coal Hole Covers
Gutter Crossing Plates
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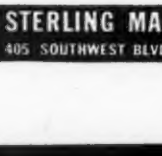

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Save Money
Save Time

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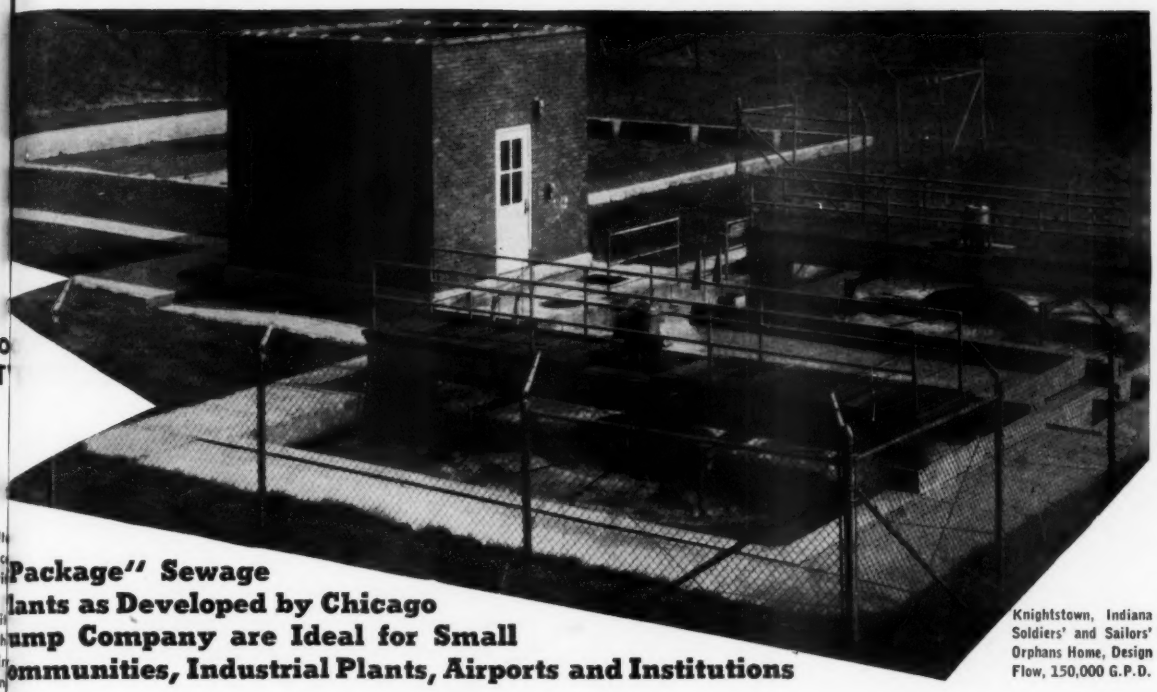

Package" Sewage
lants as Developed by Chicago
ump Company are Ideal for Small
ommunities, Industrial Plants, Airports and Institutions

Knightstown, Indiana Soldiers' and Sailors' Orphans Home, Design Flow, 150,000 G.P.D.

Because-

They require a minimum of operating supervision, produce a sparkling clear effluent, are free from flies, foul odors and unsightly appearance. Can be located near dwellings.

Initial cost of "Package" plants is low and they are inexpensive to operate.

Local Operators without previous sewage treatment experience successfully operate these plants. Former farmers, salesmen, coal-miners, truck-drivers are operating existing plants and performing other municipal duties.

Operator training service by Chicago Operating Sanitary Engineers is provided with each plant. Ingenious automatic features of Chicago "Package" plants simplify operation and assure successful performance.

Aeration and clarification are performed in a single tank with positive, automatic sludge control. One sludge setting covers a wide range of sewage flows and strengths.

Since 1934 over 100 plants have been installed and are successfully operating.

Properly designed, these units can handle industrial, cannery and other wastes as well as the usual community sewage.

The "Package" plant was specifically developed for small populations and can be engineered to meet requirements. Complete literature available.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2348 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

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NOVEMBER, 1947

A PROFIT OPPORTUNITY FOR SANITARY SERVICE OPERATORS

Here is important information for both community officials and sanitary service operators. It's the new Odorless Sanitary Cleaner, a complete self-contained mobile unit engineered especially for cleaning septic tanks, cisterns and vaults.

It eliminates all the disagreeable and unsanitary aspects of the job. It cuts to a small fraction the time required with old fashioned and makeshift equipment. (500 gal. septic tanks can be cleaned in 15 minutes). Operators can greatly improve working conditions, conform to all Board of Health regulations and materially increase profits.

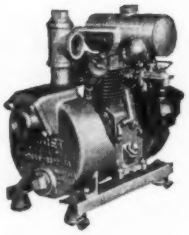
The unit is equipped with a powerful, centrifugal Gorman-Rupp sewage pump that is completely non-clogging and self-priming. It is provided complete with tank and all fittings ready to mount on standard truck chassis of 158 to 161 inches.

It represents an exceptional business opportunity in your community and no previous experience is required.

Write for complete information and literature

"HANDY" PUMP

An extremely useful and dependable pump that weighs only 20 lbs. Fitted with pipe or common garden hose it will lift up to 25 ft. and deliver 8 GPM at 40 lbs. pressure. Self - priming, electric motor driven.



THE "MIDGET"

Weighs only 60 lbs. yet pumps 3000 GPH at 20 ft. head, more than any other pump of the same weight Self-priming, husky. Trouble-free service.

Gorman-Rupp makes a complete line of self-priming centrifugal pumps ranging in capacity up to 125,000 GPH. Simplicity of design provides efficient, long and trouble-free service. A size and capacity to handle any pumping requirement.

THE GORMAN-RUPP COMPANY

GORMAN-RUPP PUMPS — UNSURPASSED FOR PUMPING FAST

320 NORTH BOWMAN STREET, MANSFIELD, OHIO

When you need special information—consult the ENGINEERS' LIBRARY on pages 69-73